United States naval medical bulletin

VOL. 10 NO. 1

UNITED STATES NAVAL
MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

UNDER THE SUPERVISION OF

THE BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT

ISSUED BY THE DIVISION OF PUBLICATIONS
BUREAU OF MEDICINE AND SURGERY
PASSED ASSISTANT SURGEON R. C. RANSDELL, U. S. NAVY, IN CHARGE

JANUARY, 1916
(QUARTERLY)

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

NAVY DEPARTMENT,
Washington, March 20, 1907.

This United States Naval Medical Bulletin is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

NOTE.

Owing to the exhaustion of certain numbers of the Bulletin and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume I, No. 1, April, 1907.
Volume I, No. 2, July, 1907.
Volume II, No. 1, January, 1908.
Volume II, No. 2, April, 1908.
Volume VII, No. 3, July, 1913.

SUBSCRIPTION PRICE OF THE BULLETIN.

Subscriptions should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C.

Yearly subscription, beginning January 1, $1; for foreign subscription add 25 cents for postage.

Single numbers, domestic, 25 cents; foreign, 31 cents, which includes foreign postage.

Exchange of publications will be extended to medical and scientific organizations, societies, laboratories, and journals. Communications on this subject should be addressed to the Surgeon General, United States Navy, Washington, D. C.

TABLE OF CONTENTS.

PREFACE.

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part as extracts) throughout the service not only will they be employed to some purpose as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Reviews of advances in medical sciences of special professional interest to the service, as published in foreign and home journals, will be given particular attention. While certain medical officers will regularly contribute to this work, it is urged that all others cooperate by submitting such abstracts from the literature as they may at any time deem appropriate.

Information received from all sources will be used, and the bureau extends an invitation to medical officers to prepare and forward, with a view to publication, contributions on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

W. C. Braisted,
Surgeon General, United States Navy.

U. S. NAVAL MEDICAL BULLETIN.

VOL. 10. JANUARY, 1916. No. 1

SPECIAL ARTICLES.

A TECHNIC FOR THE ABSORPTION TEST FOR SYPHILIS USING HUMAN COMPLEMENT.

By C. S. BUTLER, Surgeon, United States Navy, and W. F. LANDON, Hospital Apprentice, First Class, United States Navy.

It is without doubt an advantage, in the Navy, to be able to do reliable tests for syphilis, using other complement than that of the guinea-pig. On board ship and in out-of-the-way stations such as Samoa, Guam, or even some home stations, it is often impossible to get guinea-pigs. It is always possible to get a negative human serum with which to complement your tests, and we have found here that a technic which is in part like that of Noguchi and in part like that of Emery, and in which human complement instead of that of the guinea-pig is employed is quite as satisfactory as either the straight Wassermann or the Noguchi tests. The latter was run in conjunction with the test described in the 300 cases tried up to the present time, while all three tests were put through in approximately 200 cases. The Wassermann and Noguchi tests were put through by one of us (W. F. L.), while the tests by the described technic were put through by the other (C. S. B.), and neither knew the other's readings until the results were finally given and tabulated.

As between the Noguchi and the present technic the results were in agreement in 292 cases out of the 300. There were eight discrepancies, and of these it may be said that three were in the sera of men undergoing treatment, and in the fading reaction one or the other test would persist as positive longer than the alternate one. The Noguchi test was taken as the standard, and owing to the fact that the straight Wassermann, both by clinical data and by the histories of the cases, was showing greater variations from the standard (Noguchi) test than the one here described, it (the Wassermann) was discontinued.

In the few discrepancies that existed between the Noguchi and the present-described method the advantage as to the facts (positive and negative) in the particular case was not always with the Noguchi test. The hemolysin was not doubled as in the Noguchi test, but usually an intermediate amount between that completely hemolysing

the dose of red blood cells and double that amount was taken. The test would be expected, therefore, to react slightly more sensitively to small amounts of syphilitic antibody than does the Noguchi, and this probably accounts for its positive readings in the very few cases where Noguchi's test was negative. It is deemed advisable, however, in using the technic to actually take twice the amount of amboceptor which the preliminary titration of complement shows will just completely hemolyse the dose of red cells used in the test.

There is nothing new in this test. Emery used the patient's serum for complement, but whereas he allowed each patient's serum to complement his (the patient's) own particular reaction, this test uses the serum of a known negative-reacting human being for all the tests. Amboceptor paper (antihuman rabbit), antigen, and other points of the test are as in Noguchi's technic, but with reduced amounts.

Answering the objection that the complement content of human serum is uncertain and variable, it may be said that we have not experienced this trouble in any degree. The complement is the same for all tests and is titrated, so that one objection to the Emery technic is avoided, viz, the use of different complement in unknown amounts for each serum.

We do not claim that this test is any less exacting than is Noguchi's. Any reliable test of this kind requires care and pains. It is partially due to lack of these that different men come to different conclusions when testing the same sera, and when the laboratories get their results crossed our "impetuous clinical friends," who expect the laboratory to make an unerring diagnosis from a few drops of blood, have their chance, and they throw the 90 per cent of good into the same junk heap with the 10 per cent of bad results.

When practicable we would advise the employment of Noguchi's test. When not practicable, for want of guinea-pigs, we venture to hope that the careful employment of the test described below will give satisfactory results.—(C. S. B.)

THE PREPARATION OF ACETONE-INSOLUBLE ANTIGEN.

With a sharp knife trim all fat, pericardium, and endocardium from a fresh beef heart. Cut the remaining muscle tissue into small pieces and mince finely in a meat chopper. The minced muscle is macerated for from 7 to 10 days in 95 per cent ethyl alcohol in the proportion of 10 times the amount of alcohol in cubic centimeters to the weight of the tissue in grams. The maceration should be carried out at incubator temperature, 37° C., and the containers shaken four or five times a day. This has a tendency to more finely divide the tissue and insures the penetration of the alcohol to all parts, so that all the alcohol-soluble portion is taken into solution.

At the end of the incubation period all the tissue should be filtered out and the filtrate collected. This filtrate is placed in several evapo-

rating dishes and evaporated to dryness, which process is materially hastened by causing an electric fan to blow across the dishes. It is a very good idea to adjust a single layer of gauze over the tops of the dishes, to prevent the advent of flies. We have lost an entire batch of antigen through flies or cockroaches carrying molds into the evaporating fluid, the molds digesting the lipoids in a very few hours.

The resulting precipitate is then taken up in a sufficient quantity of ether. This is well covered to prevent evaporation and placed in an ice box overnight. In the morning the supernatant fluid is decanted very carefully, caution being necessary to avoid getting any of the precipitate. The precipitate is rejected and the ethereal solution is evaporated down to about one-tenth of its original volume. To this is added enough chemically pure acetone to bring it up to the volume of the original ethereal solution. This in turn is covered and placed in an ice box overnight. The following morning the supernatant fluid is carefully decanted and rejected. The precipitate is subjected to a current of air from a fan in order to evaporate the remaining acetone, which leaves a brown, sticky mass in the bottom of the dish. This is composed of the acetone-insoluble antigenic lipoids.

To make up a stock solution, for each 0.3 gram of the lipoids add 1.0 c. c. of ether. When the fatty mass is completely dissolved, add to the solution pure acetone-free methyl alcohol, 9.0 c. c. of the alcohol for each cubic centimeter of ether used. This solution will keep its strength for some time, as there is a quantity on hand in this laboratory which was prepared nearly three years ago and which still titrates as perfectly as it did when first made.

For the technic herein described the antigen is diluted 1 to 14.

THE TITRATION OF ANTIGEN.

Antigen must be titrated for hemolytic action, anticomplementary action, and antigenic property. If it shows either of the former, it is worthless, and if it does not possess the latter property, it should be thrown away.

To test for hemolytic action, put in a tube—

0.6 c. c. normal salt solution.
0.4 c. c. 1 to 10 dilution of stock antigen solution.
0.1 c. c. 10 per cent suspension human red blood cells.

Incubate for two hours at 37° C. and at the end of this time test should show no hemolysis.

To test for anticomplementary action, put in a tube—

0.6 c. c. normal salt solution.
0.4 c. c. 1 to 10 dilution stock antigen solution.
0.1 c. c. 40 per cent solution of fresh guinea-pig complement.
2 units antihuman amboceptor.

Incubate for one hour and add—

0.1 c. c. 10 per cent suspension human red blood cells.

Incubate for two hours at 37° C. and at the end of this period the tube should show complete hemolysis, which indicates that the antigen did not absorb complement in the absence of syphilitic antibodies.

To test for antigenic property—

0.8 c. c. normal salt solution.
0.1 c. c. 40 per cent fresh guinea-pig complement.
0.2 c. c. 1 to 100 dilution stock antigen solution.
1 drop positive syphilitic serum.
2 units antihuman amboceptor.

Incubate for one hour to allow antigen to absorb complement, then add—

0.1 c. c. 10 per cent human red blood cell suspension.

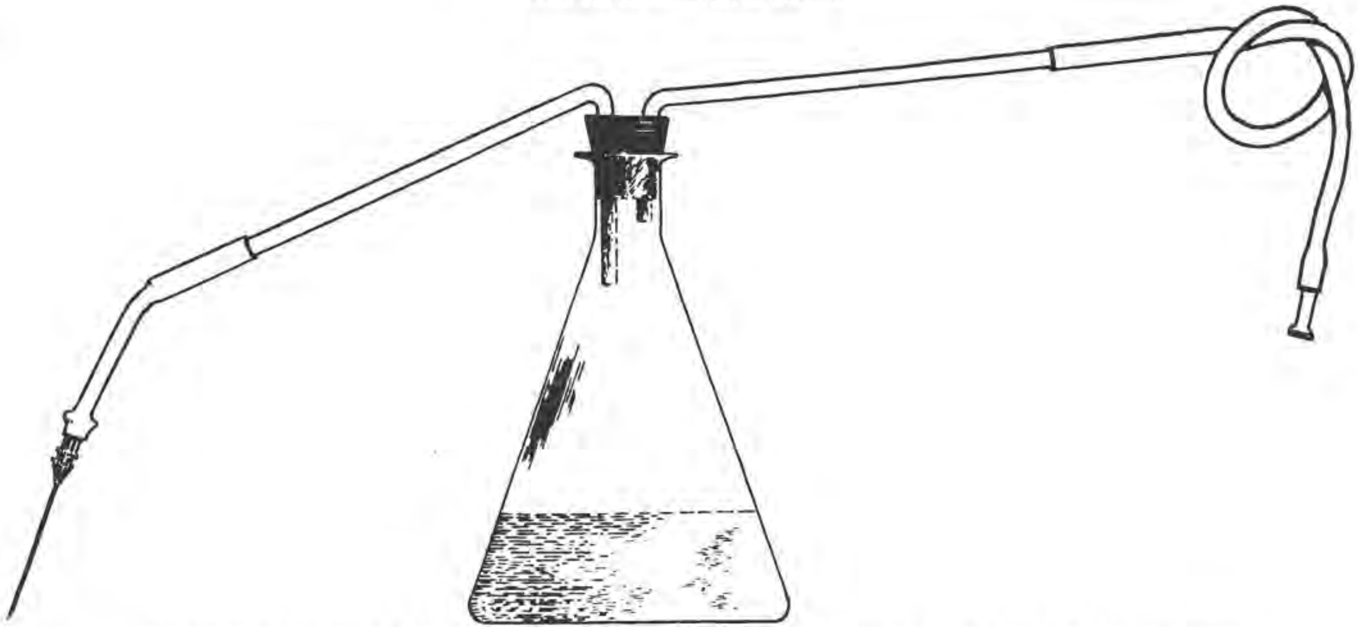
At the end of two hours' additional incubation there should be no hemolysis showing that the antigen in the presence of syphilitic antibodies absorbed complement.

THE IMMUNIZATION OF RABBITS.

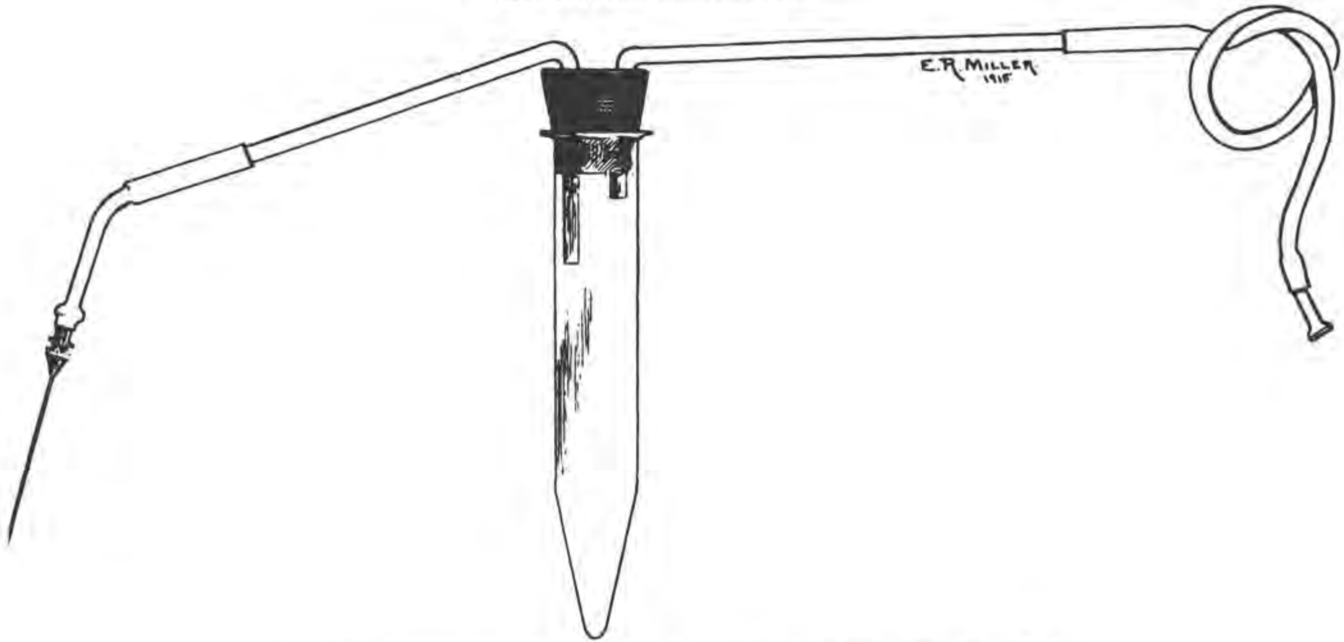
Several methods for the immunization of rabbits to human red blood cells were tried, and the following are recommended as producing sera of the highest titer as well as being ones by which the least number of animals were lost through injury and anaphylaxis:

INTRAPERITONEAL METHOD.—The human blood is drawn from a vein into a 1 per cent solution of sodium citrate in 0.9 per cent sodium chlorid solution. The resulting mixture is then centrifugalized and the supernatant fluid drawn off, care being taken at this time to remove the layer of white blood cells superimposed on the red cells. The red cells are then washed three times in 0.9 per cent salt solution, and finally a 50 per cent suspension in the same strength of salt solution is made. It is absolutely necessary, of course, to observe strict aseptic precautions. It was found that in shaking the centrifuge tubes during the process of washing, by cleaning the finger well with repeated applications of 95 per cent alcohol, the finger could be used to cover the open end of the tube without infecting the contents. The little alcohol which gets into the tube has no deteriorating effect on the blood cells.

The rabbits are prepared by shaving a spot on the belly about 2 inches square a little to the left of the median line and just inside the loose skin flap which covers the upper part of the hind leg. Just before injecting the cell suspension this site is painted with full-strength tincture of iodin. The syringe and needles are sterilized by boiling.



SYSTEM FOR DRAWING BLOOD FROM A VEIN INTO CITRATED SALT SOLUTION TO PREVENT COAGULATION.



SYSTEM FOR DRAWING BLOOD FOR COAGULATION AND CENTRIFUGALIZATION.

The rabbit is held by an assistant head downward and the intestines worked toward the stomach. The needle is inserted straight through the skin and then turned slightly toward the median line to avoid seepage, which might occur should the punctures be opposite and through the peritoneum. Extreme caution is exercised to avoid entering the bladder or intestines.

The cell suspension is injected as follows:

First day	10 c. c. (5 c. c. H. R. B. C.)
Seventh day	12 c. c. (6 c. c. H. R. B. C.)
Fourteenth day	14 c. c. (7 c. c. H. R. B. C.)
Twenty-first day	16 c. c. (8 c. c. H. R. B. C.)
Twenty-eighth day	20 to 30 c. c. (10 to 15 c. c. H. R. B. C.)

Seven days after the last injection a small quantity of blood is taken from the marginal vein of the rabbit's ear into a Wright's capsule, the serum separated and taken up on paper for titration. The amboceptor was considered sufficiently strong when complete hemolysis was given by 10 square mm. or less of the paper.

It has been our experience that five intraperitoneal injections will raise the immunity as high as possible, and that the same rabbit would never show an immunity of satisfactory titer but once.

INTRAVENOUS METHOD.—The 50 per cent blood cell suspension is prepared in the same way as described above. An area over the marginal vein of the rabbit's ear is shaved and cleansed thoroughly. The injections are given in the amounts and at the following intervals in the marginal vein of the ear, a slight movement of the needle demonstrating to the operator whether or not it is in the lumen of the vein:

First day	0.25 c. c. (0.125 c. c. H. R. B. C.)
Third day	0.5 c. c. (0.25 c. c. H. R. B. C.)
Tenth day	1.0 c. c. (0.5 c. c. H. R. B. C.)

Five days after the last injection the serum is titrated as above, and if found to be of insufficient strength a fourth injection of 1.0 c. c. is given seven days after the third. This method gives an amboceptor of high titer, but sometimes produces agglutinins, which, although in no way interfering with the action of the amboceptor, make frequent shaking of the test tubes imperative.

At all times during the process of immunization the rabbits are given the choicest of food and are kept in fresh air at least 8 or 10 hours a day. Plenty of fresh air, good food, and exercise during this time tend to keep the animals in the best of health, and healthy animals are essential to high immunity.

PREPARATION OF AMBOCEPTOR PAPER.

Many methods are recommended for drawing blood from the rabbit, but the following technic has been used in this laboratory,

successful not only from the standpoint of obtaining a good quantity of serum but of conserving the animals for future use either for experimentation along other lines or for breeding.

The rabbit is anesthetized with ether and the blood drawn from the heart, through a system of glass and rubber tubing as shown in the illustration, into centrifuge tubes. The rubber tube through which suction is made is tied loosely in a single overhand knot to prevent saliva from entering the tube, which would cause hemolysis and infection. Religious guard should be kept against these two mishaps. The other end of the system, including the needle, is washed out with sterile sodium chlorid solution, after boiling, for the same reasons.

From 60 to 70 c. c. are drawn into several tubes and placed in the incubator for about a half hour to facilitate clotting. The blood is then thrown down in the centrifuge for 20 minutes at a speed of 2,000 revolutions per minute, the supernatant serum drawn off, placed in a Petri dish, and the paper impregnated.

For this purpose the filter paper made by Carl Schleicher and Schull, No. 597, is used, as it has been demonstrated to be the most uniform. The paper is carefully ruled into strips 5 mm. wide by 100 mm. long and supersaturated with the immune serum. It is then laid on unbleached muslin to dry, as the muslin will not absorb any of the serum, and watched so that neither flies nor vermin will feed on it. In the summer a few flies will quickly spoil a batch of paper by sucking the serum from several parts of it and thereby causing nonuniformity.

When the paper has dried thoroughly it is cut along the rulings and is ready for use.

TITRATION OF AMBOCEPTOR.

Into each of a series of tubes place 0.36 c. c. of 0.9 per cent salt solution. Next put into the tubes differing amounts of amboceptor, increasing by 1 square millimeter in each successive tube, and allow to stand for from 20 to 30 minutes so that the liquid may dissolve the serum. Then to each tube add 0.02 c. c. of a known negative human serum (complement) and 0.02 c. c. of a 7½ per cent human red blood cell suspension. The tubes are then shaken gently and placed in a water bath at 37° C. for 30 minutes. The least amount of amboceptor which causes complete hemolysis by the end of the half hour is taken as the unit. This titration is performed before doing each series of tests to determine the unit for that series.

COMPLEMENT.

Human complement is used in this test and is obtained from a known nonsyphilitic person. The blood is drawn from a vein by

means of the system shown in the cut and allowed to stand in the incubator for an hour. It is then placed in the ice box overnight and in the morning thrown down in the centrifuge and the serum withdrawn. The complement seems to gain in potency when treated in this manner.

BLOOD CELL SUSPENSION.

Blood is drawn from a vein into the sodium citrate solution as in preparing for the injections into the rabbits, washed twice in 0.9 per cent salt solution, and a 7½ per cent suspension in 0.9 per cent salt solution is made.—(W. F. L.)

TECHNIC OF THE TEST.

The test is carried out as follows:

Small glass tubes, 6 by 0.6 cm. are used for the test. These are carried in small copper frames, each frame holding 10 tubes (5 sets). The absorption is carried out in a copper rectangular water bath, just broad enough for the racks, which are held by a flange at each end fitting over the side of the bath.

The final quantity in each tube of the test is 0.4 c. c. and is as follows: Front tube (control), 0.02 c. c. human complement, plus 0.14 c. c. salt solution, plus 0.08 c. c. inactivated serum of patient, plus 0.16 c. c. of sensitized human red blood cells. The back (antigen) tube contains 0.02 c. c. human complement, plus 0.14 c. c. of 1 to 14 antigen emulsion, plus 0.08 c. c. inactivated serum of patient, plus 0.16 c. c. of sensitized human red blood cells.

The absorption and sensitization of the red cells are carried out separately, which considerably shortens the time of the test.

To economize time, the first thing necessary is to start the red cells sensitizing. After this is started the absorptions are started, and after these latter have been given one-half hour and the former one hour in the water bath, we add 0.16 c. c. of the sensitized cells to each tube of the test, place in the water bath for one-half hour, and read.

Knowing the number of tests for any one day we figure the amount of amboceptor paper required by doubling the least amount shown necessary in the preliminary titration of complement, multiply this by the number of tubes (i. e., twice the number of tests), and this finally by 0.16 to get the amount of salt solution necessary for the required tests. Thus, if we have 10 tests (20 tubes) and the titration has shown that 5 sq. mm. of the particular paper will hemolyse our dose of red cells when the total amount of solution in the tube is brought up to 0.4 c. c. by the addition of salt solution, 20 times 10 equals 200 sq. mm. of the paper shaken up with 3.2 c. c. of salt solution, will give us the total quantity of hemolysin required for the 10 tests. This 3.2 c. c. is, of course, 0.16 c. c. (the amount of fluid which

takes up the hemolysin necessary for one tube) multiplied by the number of tubes. It is best to figure on a little more than our calculation shows is necessary. Shake up in the measuring cylinder the total quantity of paper required with the total quantity of salt solution until the paper is broken up, filter through a single layer of filter paper to get rid of the débris of amboceptor-impregnated paper, make up to the volume calculated, and to each c. c. of this fluid add 0.1 c. c. of a 7½ per cent suspension of human red blood cells. Stopper the container and after mixing thoroughly by gentle shaking place in the water bath and allow to sensitize while doing the other steps of the test.

The mixture of human complement and salt solution and of complement and antigen are each made separately for all the tests and the required amount of the mixtures transferred to the front row of tubes in case of the first, and to the second (back) row in the case of the antigen, with a Wright's pipette. Thus, suppose we have 20 tests to do. This will require 0.02 c. c. (amount of complement) times 20 (the number of tests), equals 0.4 c. c. of human complement in 2.8 c. c. of salt solution or 3.2 c. c. of the mixture, which is sufficient for all the controls. The same amount of complement (0.4 c. c.) in 2.8 c. c. of a 1 to 14 emulsion of antigen will give us enough antigen mixture for all the tests.

Now standardize a Wright's pipette to deliver 0.08 c. c. and 0.16 c. c. and transfer to all the front row tubes 0.16 c. c. of the complement-salt-solution mixture, and then the same amount (0.16 c. c.) of the complement-antigen mixture is transferred to each tube in the second row. Wash the pipette thoroughly after handling the antigen. It is best to have two glasses filled with 0.9 per cent salt solution, and by using one of these to draw the solution in and out quickly we get rid of most of the antigen likely to be carried over. Then we complete the cleansing by sucking up salt solution from the second glass and rejecting it and repeating this process three times. The use of a single Wright's pipette for all the tests would seem to be a serious objection, but if care be taken to cleanse thoroughly between each test in the manner described there will be no harmful results.

Up to now we have used the ordinary chemical pipettes, graduated to the tip, for mixing complement, antigen, red cells, etc. To economize time and pipettes and facilitate mixing, it will be convenient to use a single Wright's bulb pipette from now on.

The double row of holes in our racks have numbers stamped on one side which serve to orient the rack and to represent the numbers assigned to the various sera. We now number our previously inactivated sera and transfer to each of No. 1 set of tubes, front and back, 0.08 c. c. of No. 1 serum. We now wash the pipette and transfer to No. 2, front and back, 0.08 c. c. of No. 2 serum and so on through the

series. It is unnecessary to wash the pipette in going from the front to the back tube.

As each rack of five sets is completed thus far it is placed in the water bath and the time noted. Half an hour at 38° C. is sufficient tor fixation to take place. At the end of this time we add to each tube the red blood cells which should have been allowed an hour to complete sensitization. We can judge of this before adding to the test by taking 0.16 c. c. of complement-salt-solution mixture and placing it in a tube with 0.16 c. c. of our supposedly sensitized cell suspension. If sufficiently sensitized the hemolysis of the cells will be complete in about five minutes.

If complete, having thoroughly shaken our sensitized cells, transfer to each tube in the several tests 0.16 c. c., shake well, and place in the water bath again for from 15 to 20 minutes. The tests can usually be read after 15 minutes of this second incubation. In transferring the sensitized cells to the tests it is not necessary to mix with the pipette as it is when adding the serum. Simply run in the required amount at the top of the tube, and without washing the pipette go to the next.

After the proper amount is introduced into all the tubes of a rack, shake thoroughly and place in the water bath for the second incubation.

The tests are read in the usual way, a cloudy antigen tube indicating a positive test, while a clear one shows a negative result. Of course, each tube in the front row must show complete hemolysis or the test can not be read.—(C. S. B.)

THE EARLY DIAGNOSIS OF TUBERCULOSIS AS IT RELATES TO THE SERVICE AND TO THE NAVAL HOSPITAL AT LAS ANIMAS, COLO.

By G. H. Barber, Medical Inspector, United States Navy.

In the Annual Report of the Surgeon General of the Navy for the fiscal year 1907 will be found a comprehensive discussion of tuberculosis in its special relations to the naval service. In a comparison of the ratio of incidence of tuberculosis in the United States Navy with that of the German and English Navies it is stated that for five years up to 1906 the ratio per 1,000 for the German Navy was 2.4; the English Navy, 3.2; while the ratio for our service was 5.76. At that time the ratio of tuberculosis per 1,000 of population, as indicated by the death rate from this disease in the three countries named, gave England first place in point of least prevalence, Germany occupying the middle position, and the United States showing the greatest prevalence. Notwithstanding this, the ratio of tuberculosis per 1,000 for the German Navy was decidedly less than that for England, which

would seem to indicate clearly that her methods of recruiting are more certain of maintaining a high physical standard.

In the United States Navy the ratio of tuberculosis per 1,000 of force from 1895 to 1906, inclusive, was 5.0; from 1907 to 1913, inclusive, the ratio was 5.12. The average age of the enlisted men of the German Navy was given as 27 years, the average of the English Navy was 30 years, while that of the United States Navy was 23 years.

The following table showing the incidence of tuberculosis in our service from 1895 to 1913, inclusive, is introduced at this time not because of its direct bearing on the subject of this paper but rather on account of its direct bearing upon tuberculosis in general as it affects the service at the present time. In 1907 the Bureau of Medicine and Surgery instituted a searching investigation into the sanitary conditions of the service to locate and define any unfavorable conditions which might be the cause of what appeared to be a gradual increase from year to year in the number of patients afflicted with tuberculosis. It is certain that in the years which have followed the bureau has had the cheerful cooperation and support of all officers, both line and staff, in carrying out its recommendations in so far as service conditions would permit, for the general improvement of the sanitary conditions of the service both ashore and afloat. Many of its reforms have been brought to a successful issue. This is especially noteworthy in the case of our training stations. The results, so far as the incidence of tuberculosis is concerned, may be fairly represented by a comparison of the ratio per 1,000 of the seven-year period ending in 1906, which was 5.68, with the seven-year period ending in 1913, which was 5.12. The improvement is very slight, and as compared with the ratio per 1,000 in the German and English Navies it remains a very high rate.

TABLE I.—*Tuberculosis in the naval service from 1895 to 1913, inclusive.*

Year.	"A" afloat.	"RA" afloat.	"A" hospitals.	"RA" hospitals.	Total "A" and "RA."	To duty.	"I.S."	Died.	Total, "D," "I.S," "D.D."	Sick days.	Strength.	Ratio per 1,000.
1895....	38	....	22	40	100	22	63	7	92	5,368	13,191	4.57
1896....	46	....	6	38	90	10	68	6	84	4,865	14,196	3.66
1897....	54	5	8	48	115	11	84	14	109	5,462	15,734	3.94
1898....	92	26	11	92	221	37	168	15	220	5,766	23,986	4.29
1899....	67	16	26	61	170	25	127	9	161	5,437	20,819	4.46
1900....	107	43	24	109	283	46	210	14	270	5,795	23,756	5.51
1901....	119	45	27	110	301	62	211	12	285	11,116	26,873	5.43
1902....	113	36	32	106	287	50	219	17	286	11,852	31,240	4.76
1903....	178	34	72	167	451	75	346	10	431	12,047	37,248	6.71
1904....	177	24	91	239	531	76	405	23	504	23,715	40,555	6.68
1905....	151	19	92	205	467	97	332	18	447	25,765	41,313	5.80
1906....	159	37	47	224	467	74	371	19	464	21,407	42,529	4.86
1907[1]...	145	17	81	223	466	80	101	12	193	22,461	46,336	4.87
1908[2]...	218	23	101	397	739	246	108	30	384	42,513	52,913	6.02
1909[2]...	226	43	85	226	580	93	27	11	113	10,568	57,172	5.44
1910[2]...	250	28	74	265	617	143	27	19	189	11,913	58,691	5.52
1911[2]...	213	42	92	250	597	52	41	15	108	12,075	61,399	4.94
1912[3]...	155	47	100	191	493	30	29	9	68	11,448	61,897	4.12
1913[3]...	165	64	160	476	865	88	91	30	159	67,423	65,926	4.98

[1] Sanatorium established. [2] Sanatorium statistics included. [3] Sanatorium statistics not included.

Tuberculosis has been defined as a disease of urbanized populations; infecting them early in childhood; producing death in about one-tenth of the population in whom resistance is lost from ascertainable causes; but unable to kill in the nine-tenths in whom resistance continues. Accepting this definition to be a fairly accurate presentation of tuberculosis as it affects society as a whole, and the accumulation of evidence in its support is becoming more and more convincing from day to day, it would appear to point with considerable certainty to the field wherein our next attack on this problem should take place, in an endeavor to materially reduce the incidence of this disease in the Naval Service. I refer here directly to our recruiting service. It is here that the first steps in the early diagnosis of this disease must take place. In the report of the Surgeon General referred to above, this phase of the question was given the attention which its importance demands, and the statement was made that "until it is more fully realized that tuberculosis is a disease of nutrition, and until a minimum standard of physical requirement is more consistently exacted, we shall not have started in a fair way to materially reduce the tuberculosis in our service." A minimum standard of physical requirements has been determined upon and this, with detailed instructions concerning what physical defects shall constitute cause for rejection, is in the possession of every recruiting officer.

The convalescent wards of this hospital furnish abundant evidence, if such were needed, to show that these instructions are too frequently disregarded. It is rarely that one finds here a recruit who, from his general appearance, shows any evidence of ever having been in robust health. Degenerative stigmata; asymmetries of form and development; spinal curvatures; hypertrophied tonsils and adenoids; nasal deformities; under weight and height; stooping shoulders and the usual familiar signs of poor general development are extremely common among the class of patients who have been in the service a year or less, and are strongly indicative, to say the least, of a physique likely to show little resistance to infectious diseases in general, or to tuberculosis in particular. The last patient admitted to this hospital was enlisted at one of our marine recruiting rendezvous, transferred to Norfolk, where he remained during the usual probationary period, and was finally accepted in September, 1915; he was transferred to a naval hospital in October with tuberculosis and was received here in October. This recruit presented practically all the physical signs denoting poor general physique noted above, not to mention the presence of a decided evidence of arrested mental development, and at the bottom of the enlistment sheet appears in red ink a recommendation that 12 pounds underweight be waived. During periods of increased demand for men,

there is apt to appear a spirit of rivalry among the various recruiting parties and stations, causing perhaps an unconscious relaxation of standards in order to fill vacancies; a chance will be taken in the case of a candidate otherwise apparently desirable, in the hope that he may grow; in the class of recruits under consideration, this fortunate termination of the gamble rarely occurs. The fact is, they are physical defectives, easily recognized by the careful observer, and under no circumstances should they be accepted for any branch of the service. As intimated above, they constitute an overwhelming majority of the patients at this hospital at present, who have been in the service less than one year. Table II is introduced here to show the distribution of these cases from 1907 to 1913 inclusive.

TABLE II.—*Distribution of cases of tuberculosis admitted at naval hospital, according to length of service.*

Year.	Less than 6 months.	Less than 7 months.	Less than 8 months	Less than 9 months.	Less than 10 months.	Less than 11 months.	Less than 12 months.	Over 1 year.	Total.
1907	1	1	1	3	....	....	....	90	96
1908	34	9	5	9	6	5	1	114	183
1909	20	3	5	5	5	5	11	234	288
1910	9	3	6	....	2	2	3	197	222
1911	11	5	2	1	....	3	2	178	202
1912	18	3	3	2	4	3	3	139	175
1913	14	6	5	1	5	....	9	220	260
1914	8	2	4	3	6	2	....	178	203
Total	115	32	31	24	28	20	29	1,350	1,629

This table, of course, includes only those cases transferred to this hospital; it is quite probable that other cases have occurred and have not desired a transfer here for treatment. When the recent order was received here to discharge from the service all cases whose records showed this disease to have been contracted not in line of duty, 10.4 per cent of the 250 patients at present under treatment were found to be affected by this order. While these cases are not of a pensionable status, they represent a part of the total personnel allowed by law; they have spent the greater part of their total service on the sick list, they have been furnished transportation to and from the coast stations and their homes, and the hospital fund has been taxed $1.50 per diem for their care and subsistence. The remainder of the class of recruits under consideration, by virtue of having slipped by the arbitrary period of six months in the service, and thereby having their disease recorded as "in line of duty," have, in addition to the cost charges enumerated above, become pensioners of the Government for an indefinite period. Unless this class of cases can be greatly reduced in the near future they are certain to cause an additional charge to the hospital fund, due to the necessity of providing additional accommodation for an increase in the number of patients not provided for by the present plant. At

the present time this class of patients constitutes more than 20 per cent of the total number of cases under treatment.

During the past 11 months, of the 193 admissions to this hospital, 50 cases—25.90 per cent—have been second stage; 73 cases—37.82 per cent—have been third stage; and the remainder, surgical and first-stage cases—a total of 63.72 per cent of second and third stage cases.

In a great majority of first-stage cases the disease will be "apparently arrested" after from six to nine months' treatment here. The few cases which do not terminate in this manner will be found in the class of physical defectives, whose chief characteristics I have referred to above, or they will be cases in whom syphilis or alcohol, or both, play a predominating rôle in preventing the development of even a minor degree of resistance to the progress of the disease. A considerably smaller proportion of second-stage cases will become "apparently arrested," while but very few of the third-stage cases can hope for this fortunate termination even after 18 months to 2 years of treatment.

Leaving out of consideration entirely the question of our duties to the patients themselves, and viewing the matter from the standpoint of protection to the Government and the hospital fund—in other words, from a purely monetary standpoint—the question of early diagnosis becomes one of considerable importance. Every case of tuberculosis which develops in the service whose disease is recorded as "in line of duty" will continue to draw his active pay until the expiration of his enlistment, or so long as he remains under treatment at this hospital. Unless the disease can be arrested in its early stages he becomes a pensioner for the remainder of his natural life. The accumulation here of a large percentage of second and third stage cases for the protracted periods of treatment necessary to render it possible for them to live in comparatively good health in civil life with the aid of a pension, is a severe tax on the hospital fund, which in many cases could have been avoided by an earlier transfer to the hospital. It seems probable that in the near future there will be a considerable increase in the enlisted and commissioned personnel of the service. Unless the number of this class of cases can be materially reduced there will result a further demand on the hospital fund to provide additional accommodations for their care and treatment here. For several months past the daily average of patients has been from 240 to 250; an increase of 25 patients, and the normal capacity of the hospital will have been reached.

Phthisis is essentially a chronic disease, often manifesting itself intermittently. The manifestations of its onset are generally overlooked or appear in the health records as "diagnosis undetermined" or "influenza," the symptoms subsiding in the course of a week or 10

days, and the patient is discharged to duty without a suspicion having been aroused of the true nature of the trouble. The next appearance of these patients is likely to be caused by a small hemorrhage or with the history of general malaise, gradual loss of weight, perhaps a few night sweats with a persistent, dry, hacking cough. Close questioning will elicit the fact that this cough has been going on for several months. Too often the health records chronicle the treatment of these patients for protracted periods on a duty status, with prescription for "Brown Mixture" or some other simple cough sedative.

It is believed to be of the highest importance that the medical officer should realize that the disease is diagnosable at these stages. The skill required for the early diagnosis may be said to be difficult and laborious to acquire and, further, that no short cut to it does, or ever can, exist. It is commonly remarked that it is impossible to make a physical examination and arrive at definite conclusions as to the probable diagnosis in chest cases on board a modern man-of-war on account of the noise and tumult which is almost constantly present. While there is a considerable element of truth in this contention, it is believed to be possible to make such an examination somewhere, at some hour of the day, on board ship, and to arrive at the conclusion that the patient reciting the chain of symptoms enumerated above, with the presence of the more pronounced of the physical signs almost certain to be elicited, should be transferred to the hospital ship or hospital as soon as circumstances would permit. Here, at least, conditions exist which permit a thorough and complete examination of the case, which will permit the early determination of the presence or absence of an active tubercular process, and what is of paramount importance in the interest of both the patient and the service, an early transfer to this hospital of all cases in whom such active process is found to exist, the disease being "in line of duty"; otherwise, an early discharge from the service.

It is believed that the utmost importance of an early diagnosis in all cases of tuberculosis will be conceded by all, and therefore this phase of the question is not open to argument. In hospital practice cases are bound to present themselves where, after a painstaking examination, close scrutiny of the clinical history, laboratory reports, and X-ray plates, a reasonable doubt exists as to the presence or absence of an active tuberculous process, some one or more links in the chain of evidence may be considered to be absent.

From a study of the many health records which have been received at Las Animas during the past three years, one becomes impressed by the great mass of interesting and instructive data contained therein, more especially as it relates to the amount and kind of endeavor

made by the various medical officers to arrive at an accurate diagnosis. It should be noted here that during the past two years it has rarely happened to have a patient admitted and subsequently found to be free from tuberculosis. Contained in this mass of data two especially instructive and important features have particularly impressed themselves upon the mind of the writer, and they alone will be made the subject of comment in this paper. Their importance becomes enhanced by the fact that I believe them to be responsible in great measure for the presence in the hospital at the present time of so large a percentage of second and third stage cases. As noted above, they represent 63.72 per cent of all cases admitted during the past 11 months.

Somewhere in a great majority of all health records will be found the statement "Von Pirquet's test strongly positive," "weakly positive," or "negative," as the case may be. Only once during the past 11 months has there been recorded the statement that a subcutaneous tuberculin test had been made. It is now recognized by all authorities that the use of tuberculin in the early diagnosis of tuberculosis, when the results obtained are interpreted in the light of the known and established facts, is of the utmost value. One test is of definite account when positive; another, only when negative; a third will reveal evidence whose value amounts to certainty, probability, or nullity, according to circumstances, and all within the limits of a test upon one patient. The value of any one tuberculin test is no longer a matter of opinion but one of ascertained fact. A milligram given subcutaneously produces the same effects in the hands of one observer as in those of another. Riviere, in his "Early Diagnosis of Tubercle," makes the following statement in regard to one of the tuberculin tests: "No one can in these days rely on a positive Von Pirquet reaction as evidence of active tuberculosis in the adult and retain our respect for his intelligence; a vast mountain of fact is against him." From the great mass of recent accumulated results recording investigations to determine the value of the tuberculin tests in the early diagnosis of this disease, the following general truths will be found to impress themselves with more or less clearness upon the minds of all unbiased persons: First, the value above all other events of a focal reaction; second, the worth of negative results to the subcutaneous, and to a less extent, to the cutaneous tests, in the exclusion of active disease; third, the very much less value, only that of probabilities more or less high, attached to the determination of tuberculin sensitiveness, whether skin or tissue, in diagnosis. It is not deemed practicable or necessary to review here the large volume of literature which has accumulated in recent years concerning the value in early diagnosis of the tuberculin tests. I

shall, however, quote in brief a general summary, to be found in the October, 1915, issue of the British Journal of Tuberculosis:

(*a*) A focal reaction set up by doses of subcutaneous tuberculin is definite proof of active pulmonary disease.

(b) When a dose of 0.01 c. c. has been given without producing a focal reaction the case may be said to be negative.

(*c*) No case is fully tested unless this dose has been given at least once.

(*d*) In the large majority of cases, slight general reactions are set up by small doses, which reactions can be, with proper precautions, ignored—indeed, must be ignored—if more than a small minority are to reach the final dose.

(*e*) In 36.9 per cent of presumably negative cases, reactions which can not be ignored are set up by larger doses or by repetition of these, with the consequent discontinuing of the test before the final dose is given; these cases are insufficiently tested.

(*f*) Cases with moderately extensive signs should not be tested, and these, along with febrile suspects, form about 15 per cent of all doubtful cases.

The subcutaneous tuberculin test until one year ago was the most delicate diagnostic method available. Recently the work of Radcliffe, Mackintosh and Fildes, and de Wesselow, on the combined determination of the complement fixation, reaction, and estimation of the tuberculo-opsonic index, has shown that an accurate diagnosis can be made by such serum methods in at least 90 per cent of suspected cases. These tests, too, can be made without any contraindications whatsoever.

The second and final feature of this discussion to be considered is perhaps of greater importance than the employment of the tuberculin or serum tests. I refer to the practice on the part of a considerable number of medical officers of waiting for the detection of tubercle bacilli in the sputum before making a diagnosis or considering a recommendation for transfer to this hospital. That this practice is general throughout the service is plainly evident from a perusal of the health records in many cases. The following histories are briefly reported as striking illustrations of both phases of this discussion:

Case No. 1. Admitted to sick list on board ship June 13, 1914. Diagnosis undetermined; in line of duty. It is noted that the following symptoms, suspicious of tuberculosis, are present: Irregular fever, 99.0 and above since February 10, 1914; fever mostly in afternoon; chills not severe; very profuse night sweats; slight cough; slight pain in chest near heart; loss of weight, 10–15 pounds in one year; poor appetite; scanty sputum, unable to obtain sample for examination; patient subject to winter colds; mother died of tuberculosis. Transferred to hospital same day and readmitted with same diagnosis: No sputum; stools negative for T.B.; dullness; whispering pectoriloquy; prolonged expiration right apex. July 5: Physical examination reveals dullness right apex; pronounced pectoriloquy; evidence of consolidation to second rib; unable to obtain specimen of sputum. Weekly entries follow, recording little or no change, with frequent negative examinations of sputum, until September 16: "Moro test" made, negative. November 3, 1914, the diagnosis was changed to bronchitis chronic—very little cough; feels much improved. November 6:

Discharged to duty. December 3, 1914: Admitted on board ship, bronchitis chronic; in line of duty. Symptoms, as recorded before, are strongly suspicious of tuberculosis, patient having night sweats, loss of weight, poor appetite, weakness, pains in chest, cough with scanty expectoration; no definite physical signs noted; to hospital same day. Here he was readmitted with same diagnosis and origin. December 5: Sputum negative for T.B. Weekly entries follow, noting condition unchanged and sputum negative for T.B. until January 12, 1915; the entry is made, tubercle bacilli found in sputum. The same day diagnosis changed to tuberculosis, chronic pulmonary; medical survey requested, and held January 15. January 29: Transferred to this hospital, where he was received February 1, 1915, and where, from the physical signs noted, he was classed as an advanced third-stage case.

From the history of this case it is probable that a diagnosis of tuberculosis was justified in June, 1914; certainly on July 5, 1914. Such doubts as might have arisen would certainly have been dissipated by the use of the subcutaneous tuberculin test. It is difficult to escape the conviction that the minds of the medical officers having this case in charge were centered on the belief that tubercle bacilli must be demonstrated in the sputum before a diagnosis and recommendation for transfer to this hospital was justified.

Case No. 2. For several months during the latter half of 1914 patient was under treatment for hypertrophic rhinitis and frontal sinus disease. In November, 1914, suspicion of some constitutional disturbance evidently arose; entry is made on the 9th, Wassermann negative. November 14, Von Pirquet negative. November 17, transferred to hospital, where he was readmitted with sinusitis frontal; some irritation of nose; has a bad cough and pain in chest; sputum examination gives pneumococci. November 28, troubled with some bronchitis. January 8, 1915, diagnosis changed to bronchitis, chronic; duty; while on outpost duty. Repeated examinations of sputum negative; has run a temperature since admission to hospital; has lost no weight recently; X-ray shows several suspicious areas in both lungs; numerous râles are heard over both lungs; no increased pectoriloquy or fremitus; no treatment has seemed to benefit the bronchitis. January 9, 1915, to duty; general condition good; still has cough. February 13, admitted to sick list on board ship. Diagnosis, tuberculosis, chronic pulmonary; duty, incident to service. Physical examination shows consolidation of upper right lobe posteriorly and infiltration anteriorly down to second rib; sputum negative for T. B. To hospital same day. Readmitted to hospital—duty—as stated above; family history and previous history negative. Complains of cough (with sputum) which began while in Mexico last summer. Infiltration upper lobe, right lung. Temperature normal on admission. February 15, 1915, attack of dyspnea began during the night; slight fever; cough dry; no physical signs of asthma; slight chill at 12.30 p. m. Temperature, 100. (No history of malaria; blood negative for malaria.) Sputum negative for T. B. February 16, 1915, entirely recovered from attack of chill and dyspnea of yesterday; no fever; continue in bed; sputum negative for T. B. February 19, 1915, tuberculin test (Moro's reaction) positive. February 28, 1915, slight afternoon fever at times; losing weight (5 pounds in 15 days); cough with sputum; repeated sputum examinations negative for T. B. There follows a series of weekly entries recording condition of patient and many sputum examinations until May 11, 1915. Medical survey held; recommendation that he be held for further treatment. June 6, 1915, did not do so well during

last week; lost 5 pounds in weight; otherwise the same. Since admission 21 specimens of sputum examined and all negative. June 12, 1915, has been worse during past two weeks; lost 10 pounds during that time; afternoon temperature, 99; pulse 100–115; respiration, 25–30; cough and sputum the same for past month or so; sputum negative. July 4, 1915, general condition is growing worse steadily; weaker; "sweats" more frequent; pulse, 108–120; respiration, 25–30. July 10, 1915, condition about the same; Wassermann negative. July 23, 1915, tubercle bacilli found in sputum; survey requested; recommendation that he be transferred to Las Animas for treatment.

The patient was received at this hospital August 9, 1915, where he was classed as an advanced third-stage case. With the exception of a small area of the lower lobe, the entire right lung was involved; in the left lung there were two areas of light to heavy infiltration in upper lobe, and about half the lower lobe posteriorly heavily infiltrated. There would appear to be but little doubt that the diagnosis of tuberculosis made on February 13, 1915, on board ship, was correct and, further, such doubts as did arise could have been promptly cleared up by using the subcutaneous tuberculin test. It may be noted that after his arrival here, four antiformin sputum examinations were made, the last one only proving to be positive.

The appearance of tubercle bacilli in the sputum is not an early sign of pulmonary tuberculosis; on the contrary it is positive evidence of a breaking down of tissues, and in a large percentage of cases this does not take place until a considerable amount of one or both lungs have become involved. The failure to arrive at a correct diagnosis of this disease prior to the appearance of tubercle bacilli in the sputum must now be regarded as a reflection on one's diagnostic ability.

When this hospital was first established, word was passed around that it was the desire of the bureau, in the case of patients recommended for transfer here, that a statement should be made on the survey "Tubercle bacilli demonstrated in sputum." A desire to avoid, if possible, transportation expenses of cases not tubercular in nature, was undoubtedly the reason for its promulgation. That it has become a service tradition seems well established by the entries contained in a majority of the health records on file at this hospital. Owing to the unfortunate and costly results, both to the patient and to the service, this matter has recently been the subject of an official communication to the bureau, and I am authorized to state here that "beyond a service tradition there is no foundation for the belief, unfortunately common among medical officers, that the statement upon a medical survey that tubercle bacilli have been found, is indispensable before such survey will be approved by the Bureau of Medicine and Surgery. The bureau looks with disfavor upon the continuance of the practice."

CONCLUSIONS.

1. That the ratio of incidence of tuberculosis in the Naval Service shows a discouragingly small decline during the past seven years.

2. It is in the recruiting service that the first steps must be taken in the effort to reduce the ratio of incidence of tuberculosis in the service.

3. That the classification on admission at Las Animas during the past 11 months of 63.72 per cent of second and third stage cases is not a creditable showing for the Medical Corps under service conditions.

4. That the use of the subcutaneous tuberculin test and the serum reactions, when interpreted in the light of established facts, are of the utmost value in the early diagnosis of some doubtful cases and should be more generally made use of in our hospitals.

5. That tubercle bacilli in the sputum is not an early sign of tuberculosis; the statement of their presence on a report of medical survey is not looked for or requisite for its approval by the Bureau of Medicine and Surgery, the bureau looking upon a continuance of the practice with disfavor.

STUDIES PERTAINING TO LIGHT ON SHIPBOARD.

I.

By T. W. Richards, Surgeon, United States Navy.

Writing in 1909, Gatewood[1] concludes his chapter on "Light within and without the ship" with the following pertinent remark:

> It seems advisable to note the rapidly growing disposition to believe that artificial illumination in the naval service, afloat or ashore, can be greatly improved. To those who live on ships it is quite apparent that the subject is well worthy of exhaustive investigation.

This was excellent advice and we may safely assume that it is just as sound to-day as when it was written, for the intervening years have been marked by considerable changes in the quantity and quality of light on shipboard, due to a more general introduction of the tungsten lamp and perhaps greater liberality in the expenditure of electrical power. Moreover, the general subject of illumination has received much attention in recent years, as indicated by an extensive literature and marked improvements in design of equipment and methods of installation. "Illuminating engineering" has become a highly developed specialty, bearing very directly upon the health, welfare, and happiness of nearly every civilized community. In the naval service this subject, which embraces some of the major problems of hygiene and engineering, has been ably discussed by various officers, but especially by Smith, Parsons, and Gatewood himself. Nevertheless, if those medical officers who actually "live on ships"

[1] "Naval Hygiene." By Medical Inspector J. D. Gatewood, United States Navy, 1909.

have recently heeded the admonition quoted above, it does not appear that their observations have been recorded in print; lest this be deemed hypercritical, I hasten to add that the present paper is in no sense a record of original investigation, but rather a brief discussion of general principles, with particular reference to certain recent literature which may not be readily accessible to individuals afloat.[1]

As a matter of fact, the medical officer on shipboard who attempts to approach the subject of illumination in a practical way is soon beset by serious embarrassments, for the problems involved are not only sufficiently difficult in themselves but they become doubly so under ordinary conditions afloat, owing to lack of apparatus for making exact observations. It may be well, therefore, for us to bear in mind the twofold nature of this subject. In part—and this part is fundamental—it pertains to hygiene, but many, or most, of its practical applications fall within the province of the electrical engineer, and if we are to cooperate with him intelligently we must necessarily have a fair understanding of the limitations under which he is compelled to work. In this respect illumination is obviously analogous to other, perhaps more familiar, problems on shipboard, such, for example, as those pertaining to "ventilation."[2] Thus, as naval sanitarians, we may say that under given conditions a certain amount of air should be supplied and properly distributed; that such air should possess definite physical properties (i. e., as to temperature, humidity, etc.), and that noxious constituents must not exceed a specified maximum. But, if we are reasonable, we do not insist that the initial air space must be at least 1,000 cubic feet per capita or that the velocity of air currents can not exceed the customary limits maintained on shore. In short, we admit that the constructors are right in contending that we can not attain ideal conditions on a warship, and we know by experience that an approximation thereto serves fairly well (which is not to imply, by any means, that we should neglect opportunities for betterment).

Reasoning from analogy, let us assume that similar conditions prevail with respect to illumination; our difficulties will be materially restricted, then, if we state the case somewhat as follows: "Warships not being primarily designed as habitations, illumination thereon will probably not conform to the very best standards ashore. On the other hand, with the present high development of electric

---

[1] While ships' libraries contain reference books on nearly every technical subject it is a curious fact that no work on "Illumination" is included, an oversight which might well be rectified.

[2] Sometime ago, upon requests of the editors, a paper was written for the Bulletin by a representative of the Bureau of Construction and Repair giving "The ship designer's point of view on ventilation" (by Naval Constructor R. H. Robinson, United States Navy. Vol. VI, No. 4). A similar article by an expert accustomed to designing our lighting systems on shipboard would be of great interest and value.

lighting, the more serious defects are unlikely. Investigation, therefore, may be most profitably directed toward the 'twilight zone' which lies between actual conditions and those we deem ideal." It might appear that this zone should steadily tend to become narrower, but this does not necessarily follow, since improvements afloat are not likely to do more than keep abreast of advances on shore. The debatable ground may therefore shift its position, and we should at least be able to determine its limits at any particular time.

Returning for the moment to our analogy, it may be said of ventilation that it deals primarily with air—matter—something we can readily define, measure, weigh, and analyze with accuracy. Light is far more elusive. In everyday life we are accustomed, perhaps, to think of it erroneously, as an entity, differing from heat, for example, much as sound does from gravitation; or we may simply regard it as something which enters the eye and enables us to *see*. Such a physiological conception, while true enough as far as it goes, is evidently very incomplete; a blind man would complain, with reason, that we have not described the thing itself, but merely one of its effects—an effect, moreover, which to him is wholly inconceivable. We may therefore revise our definition along physical lines and say that by light we simply meant radiant (or electromagnetic) energy[1] of specified wave lengths which, upon being absorbed by certain substances, is capable of producing heating and chemical effects.

Plainly this does not help the blind man, as other parts of the spectrum produce the same effects in greater degree, and his difficulties are, in fact, insuperable, for there is no such thing as light, *in the ordinary sense*, except for those who have apparatus adapted to perceive it. It is quite conceivable, therefore, that certain animals might, or even may, possess organs of vision sensitive to rays longer or shorter than those of our visible spectrum, animals, indeed, which can "see in the dark." Owing to the truly remarkable evolution of our eye, we are apt unconsciously to overestimate the relative length of the visible spectrum and also the energy so expressed, as

[1] It does not appear that at the present time there is any theory of radiation which is wholly acceptable or accounts fully for all the facts. As is well known, recent conceptions regarding the nature of light, and indeed the relations of "matter" and "force" in general, have profoundly affected the very basis of physical science, and as new speculations are almost daily in evidence it is difficult for the layman to keep in touch with current opinion. But the electron or "corpuscle"—an unfortunate term, from the physiologist's point of view—appears to have come to stay. While we usually associate them with the X-ray tube (cathode rays), they "have been found literally to pervade the universe. * * * Without doubt they play a part in cosmical physics; the most recent explanations of the aurora or northern lights regard them as due to enormously fast electrons ejected by the sun, which are collected and guided in long spirals to the polar latitudes by the earth's magnetic lines of force. They there ionise and cause luminosity in the upper attentuated regions of the earth's atmosphere, just as they do in a vacuum tube." (Kaye.)

It seems not unreasonable to suggest that so universal an influence may likewise have had some bearing upon organic evolution as a whole, though its effect upon individual organisms might well be inappreciable.

compared with that of waves above or below its limits. Thus, rays which left a star some centuries ago might now be clearly perceptible to us if they happen to be transmitted as "light," but would be wholly inappreciable (though perhaps measurable) if vibrating as waves of "heat." It is said that the equivalent in work of the minimum stimulus to which the eye can respond is equal to that done in raising one ten-millionth of a milligram one millimeter in height, and that light from a rapidly rotating mirror is visible even when it falls upon the retina for one eight-millionth of a second. (Halliburton.) As for rays beyond the infra red and the extreme violet, they cover so vast a scale that the limits of our visible portion—extending, say, from $770\mu\mu$ to $360\mu\mu$—seem relatively insignificant, as the following extract from a recent writer clearly sets forth:

> With the addition of X-rays[1] to the electromagnetic waves already known the table of wave lengths is extended greatly in one direction. At the other end of the scale are the waves which were originally discovered by Hertz and are now used in wireless telegraphy. The longest wave length generated up to the present is about 15,000 meters, or a little over 9 miles; the shortest is a few millimeters. The waves ordinarily used in "wireless" are a few thousand meters long. * * *
>
> Next to Hertzian waves, in order of magnitude, come the infra-red or heat waves, the greatest wave length yet observed being one-tenth millimeter. We pass from these right through the visible spectrum to the ultra-violet rays, which have been explored as far as wave length 10^{-5} centimeters; these are examined photographically. An extreme form of ultra-violet rays is probably represented by the "Entladungstrahlen," which are emitted from electric sparks, or the negative glow in a discharge tube. * * *
>
> Next come X-rays with wave lengths of the order of 10^{-8} centimeters, and beyond them the most penetrating of all, the gamma rays, of whose wave lengths little is known.
>
> The various wave lengths * * * cover * * * the amazing range of one thousand million millionfold.

Speaking in general terms, it may be said that the effects produced by the various portions of this entire spectrum will depend primarily upon the physical properties of bodies upon which the waves fall, some being absorbed, while others are transmitted or reflected without loss of energy. Hence, a substance which is transparent, or nearly so, for rays of certain wave length may be quite opaque[2] with respect to others not far removed in the spectral scale, a matter of much practical importance in the consideration of illuminants; thus "rock salt is transparent to heat, to visible waves, and to ultra-violet

[1] "X-rays." By G. W. C. Kaye. London, 1914.

Kaye has this to say regarding the nature of X-rays: "It is only within the last year or so that controversy has been stilled by the discovery that X-rays can be reflected and diffracted by crystals. There can scarcely be any doubt now that X-rays are identical with ultra-violet light of extremely short wave lengths; wave lengths, in fact, of the order of the diameter of the atom."

[2] "Transparent" and "opaque" are merely relative terms; as Gatewood points out, glass, for example, becomes sensibly opaque to light if thick enough, while a sheet of metal transmits some luminous rays if sufficiently thin.

waves; ruby glass to red-light waves; paraffin wax to Hertzian waves; white fluorite, the most transparent substance known, to heat, to visible waves, and to ultra-violet waves; thin deposits of metallic silver to ultra-violet waves; thin aluminum plates to roentgen waves; and thin metals of all kinds to gamma rays."[1] Absorption, when it occurs, is due to the fact that atoms of matter can vibrate in definite periods, and such vibration will be produced by ethereal waves of appropriate position in the spectrum. The energy so transferred to atoms is commonly dissipated in heat effects, but this does not always occur, as it may happen that the vibrating atoms can, in turn, emit ether waves of their own. "Thus a solution of quinin absorbs ether waves whose period is so short that they are invisible, and in return for them emits violet and blue light." This is "fluorescence,"[2] a phenomenon which is said to occur at times in the crystalline lens under the influence of ultra-violet rays. In all cases the exciting waves are of shorter period than those of the secondary rays.

While the physiological and pathological effects of solar radiation have for a number of years received great attention, resulting in a vast amount of speculative literature, there is still an astonishing lack of concordance in the views of various investigators. "Sun baths" and "light baths" of various types have been prescribed for nearly every conceivable complaint, while other authorities have gone to the opposite extreme in attributing ailments of infinite variety to undue or even moderate exposure to light. Upon two points, however, there appears to have been general agreement, viz, that the more obvious and marked effects are produced by the shorter waves and that pigmentation of the skin, whether natural or acquired as the result of exposure, tends to minimize such effects. Woodruff[3] has perhaps discussed these questions in greatest detail, but I think it must be admitted that his attitude represents the extreme view. The great difficulty in such investigations lies in the numerous factors involved in sunlight, and when, by artificial means, some of these are separated or eliminated the whole environment is so changed that exact comparisons become unsafe or impracticable. It is quite certain, for example, that light from the quartz lamp—which emits chiefly waves of short length—is vastly different from sunlight, but it is used in the treatment of tuberculosis and its curative effects in part attributed to a different class of radiation altogether. Thus Hagemann,[4] referring to skin pigmentation, says:

---

[1] Ed. Jour. Am. Med. Assn., Aug. 14, 1915.

[2] If such emission continues after the exciting rays are cut off the body is said to be "phosphorescent."

[3] "The Effects of Tropical Light on White Men." By Maj. Charles E. Woodruff, surgeon, United States Army.

[4] See Scientific Am., Sept. 11, 1915, referring to an article by Dr. Richard Hagemann in the Deutsche med. Wochenschrift.

How does this pigment act? According to recent investigations it appears to be settled that the pigment forms not only a protection against the toxic effects of the chemical rays of light, but also transforms the short-wave rays into long-wave rays, therefore into red and ultra-red or heat rays, which in turn penetrate more deeply. So the pigment, to a certain degree, acts as a sensitizer for the long-wave light. The actual curative effect, therefore, should not be ascribed to the short-wave rays, but to the warm light rays.[1]

If such complex physical and physiological reactions do indeed take place, it will be seen that the whole question becomes vastly more complicated.

While the X-rays and γ-rays present special problems which will not be touched upon here, it seems pertinent to call attention to the waves of great length—Hertzian waves—at the opposite end of the spectrum. Exposure to such radiation is now practically constant, especially so, perhaps, on naval vessels, and the possibility of pathological effects where this is most intense can not be denied. That some effect is produced is certain, for these rays are known to be absorbed by the tissues. Such effects might be particularly difficult to determine, for they would not, presumably, be confined to a single class of persons, such as radio operators, as the same influences would almost inevitably affect an entire ship's company, though possibly in lesser degree. At any rate no investigations along this line appear to have been conducted.

So far as solar radiation is concerned, experience in the naval service does not, perhaps, incline one to the more extreme views regarding its deleterious effects. Certainly there is much exposure, for most of our ships follow the sun in its annual migration, and the totally inadequate protection afforded by our headgear has not only been the subject of much adverse criticism in our own service but it is a constant source of wonderment abroad. Nevertheless, gross effects have always occupied a minor rôle in our morbidity returns, and injuries from radiant sources *within* the ship have been far more conspicuous. It is perhaps particularly fortunate that such has been the case, for it may be pointed out that external conditions are not tending toward improvement, but quite the reverse. It is a fact that many officers and men are now much more exposed to the sun than formerly, owing to the growing disuse of awnings. On a modern battleship practically the entire upper deck, fore and aft, is taken up by the guns and turrets. The main battery and gun drills can not be properly conducted unless this space is kept clear; as such drills are steadily increasing in frequency and importance deck awnings on an up-to-date man-of-war bid fair to become as obsolete as topsails. This situation thus affords a fair illustration of the many

[1] It should be added that in practice Dr. Hagemann supplements the quartz lamp with electric incandescent lamps, and finds that pigmentation occurs more quickly and deeply under the combined light than with the quartz light alone. Pigmentation, then, is not due wholly to the shorter waves.

unexpected modifications in environment that inevitably attend radical developments in naval design. While I am not prepared to say that no harm will result if this practice is carried to its logical extreme, and I heartily deplore the present headdress, it must in fairness be admitted that I have seen no serious case of insolation—using this term in a very broad sense—on my present cruise. But this observation applies only to conditions on shipboard, where the additional factors of overexertion, fatigue, and lack of air movement are not commonly encountered in sunlight. Indeed, I am strongly inclined to believe that when these association factors receive their full measure of recognition the much abused "ultra-violet light" will be relieved of considerable responsibility, for if we wished to select a place where these waves could exercise their baneful influence unobstructed, the exposed deck of a battleship in Guantanamo Harbor would seem to afford ideal facilities. At any rate, in my opinion there is much to be said for the Italian proverb which I have somewhere seen quoted, as follows: "*Dove non va il sole va il medico.*"

But whatever the general effects of this exposure, it is hardly open to doubt that such a constant flood of light, particularly when aggravated by tropical glare from the surrounding water, must have a marked influence upon our organs of vision. The more completely we adapt ourselves to such abnormal conditions on deck the greater will be our sense of contrast when going below, and I believe this is largely responsible for the general craving for "more light" which is so very common on shipboard. Under the most favorable conditions there is an enormous difference between daylight illumination of interiors and that out of doors, and this must be even more extreme on shipboard.[1] Practically speaking, then, we are at all times dependent upon artificial illumination below decks, either wholly or in part.

Visual sensations are of two types, those due to color and those due to shade only, the latter extending from white through gray to black. In the main, these different sensations correspond to definite physical properties of light. Thus, wave length determines the hue (red or green, for example); purity of color occurs with waves of a single order of length, while intensity is coordinate with their amplitude. It also appears, however, that colors may differ in brightness or luminosity, which "is a purely psychological quality devoid of any known physical counterpart" (Halliburton).[2]

---

[1] If the illumination of a piece of white paper be measured, first when the paper is placed on a table in the middle of an average room, and then when placed on a table outdoors in an open space, one finds a difference of, say, 1,000 to 1 in favor of the latter position. * * * Most people * * * would estimate the respective illuminations at, say, 2 to 1 or 3 to 1, and would consider even 100 to 1 ridiculous.

[2] Handbook of Physiology. 1915.

The capacity to distinguish color differs considerably with different intensities of illumination; with a very dim light the sensitiveness is greatest for green and comparatively low for red, while with high intensities it is greatest for yellow light. For this reason it has been suggested that red is a poor color for danger signals, but it has so long been universally adopted for this purpose that any change is impracticable. It would also appear that the best color for searchlights would be a greenish blue "if it were not that such rays penetrate fog less effectively than yellowish lights." (Bohle.) As the effectiveness of searchlights in fog is extremely limited anyway, this might be open to some doubt; while I have no available data on the actual color employed, it does not, to my eye, appear appreciably yellow, but tends rather from white to blue.

The ability of the eye to distinguish differences in the strength of light is of such fundamental importance in all systems of artificial illumination that I shall quote somewhat liberally upon this topic. "Within very wide limits of brightness, differences in the strength of light are equally distinct or appear equal in sensation, if they form an equal fraction of the total quantity of light compared." This is "Fechner's law," said to be substantially as stated by Helmholz, but Bell's own explanation thereof seems somewhat clearer; he says that "provided the parts of the visual picture remain of the same relative brightness, the distinctness of detail does not vary materially with great changes of absolute brightness. Now, since, barring binocular vision, our whole perception of visible things depends, in the absence of color contrasts, upon differences of illuminations the importance of the law just stated needs little comment. * * * Within very wide limits of intensity artificial lighting remains about equally effective for most practical purposes." The fractional difference thus appreciable—known as Fechner's fraction—amounts to about 0.01; "that is, two adjacent surfaces can, under ordinary circumstances, be distinguished as separate, if one reflects to the eye about 1 per cent more effective light than the other," provided, however, that the two objects are of about the same color, for determination of the relative brightness of two surfaces which differ materially in color is not only well-nigh impossible by ordinary observation, but it involves some of the most difficult problems of practical photometry.

Fechner's fraction, however, not only fails with very dim light, but it does not hold good beyond a certain maximum of brilliancy, and "it is this variation of Fechner's fraction which determines the minimum amount of artificial, or, for that matter, natural light, necessary for clear vision. Now, illumination sufficient to bring Fechner's fraction up to its normal value—that is, to get the eye into its steady state with respect to shade perception—is sufficient, so far

as this matter is concerned, for good vision, and anything above such amount represents waste light."

"Besides Fechner's fraction, which expresses shade perception, another factor of equal importance enters into practical seeing. This second factor is visual acuity—that is, the ability to see fine detail, assuming strong contrast, as, for example, between type and the background of the page. This power of acuity is in great measure independent of the power of shade perception as such," and "seems to depend on the structure of the retina and the quality of the eye as an optical instrument rather than upon its direct or secondary sensitiveness to stimulation by light." Now "it appears that shade perception and visual acuity reach their steady state in the eye for all practical purposes at about the same point and that this point is not far above 20 meter candles. In other words, with this illumination, the eye practically reaches its normal working condition, and beyond this point relatively little improvement can be made by providing more light."[1]

The amount of light required, however, is somewhat dependent upon the surroundings, and it is probable that the above estimate is based upon a room with very light walls. Where the walls are dark the alternate expansion and contraction of the pupil as the eye wanders from their dim surface to, say, a brightly illuminated paper, tends to cause glare and demand a higher illumination. Experiments by Bohle show that the requirements may thus vary more than 100 per cent; thus the amount of light needed to read ordinary print with dark green walls is said to be 30 meter candles, white walls (under indirect light) requiring only 15, while for a room with walls that are "pale blue"—somewhat like those on shipboard perhaps—not less than 28 meter candles (2.62-foot candles) are deemed sufficient.

I have given these authoritative views at some length because on shipboard, as elsewhere, complaints are apt to arise readily enough if it seems that there is not enough light, and if an attempt is made to remedy this real or apparent defect we are apt to go to the opposite extreme. On the other hand, a great excess of light may be endured and wasted, if nothing worse, without attracting any attention, when a better distribution, with perhaps considerable loss in the process, would be extremely advantageous. The practical problem as to how the necessary light may best be obtained can be deferred until the system of illumination employed on shipboard is considered as a whole. It appears, however, that under usual conditions, with overhead lamps—at about the height commonly in vogue on shipboard—1 candlepower to 2 square feet of floor space gives brilliant effects,

[1] "Art of Illumination." By Louis Bell. London, 1912.

1 to 4 does well if locally increased where necessary, while 1 to 3 affords very good illumination for ordinary purposes.

Referring again to color sensations, it seems difficult to appreciate the fact that apparent "brightness" is not necessarily commensurate with energy, or that, as one writer expresses it, "Physically there is no such thing as brightness or equality of brightness.[1] The difficulty apparently lies in the fact that a given amount of energy, say, in the red, produces a sensation of this class which is quite different in degree from that due to an equal amount of energy in another portion of the spectrum, such as the yellow or blue, and "it has been amply shown that sensation increases with increase of energy by different laws for energy of different wave lengths." According to Bell about 87 per cent of the effective luminosity of white light lies between the lines C (scarlet) and E (deep green), the relative luminosities at various points of the spectrum being about as follows:

Line.	Luminosity.
B	3
C	20
D	98.5
E	50
b	35
F	7
G	0.6

While the differences in color of most illuminants are not usually extensive, exception may be made in the case of one, the mercury vapor lamp, which is commonly used on shipboard, and the peculiar quality of the light from this lamp will be referred to again. But with all modern illuminants there is an enormous waste of energy, as indicated by the following table, which shows the luminous efficiency or percentage of total energy radiated as visible light:

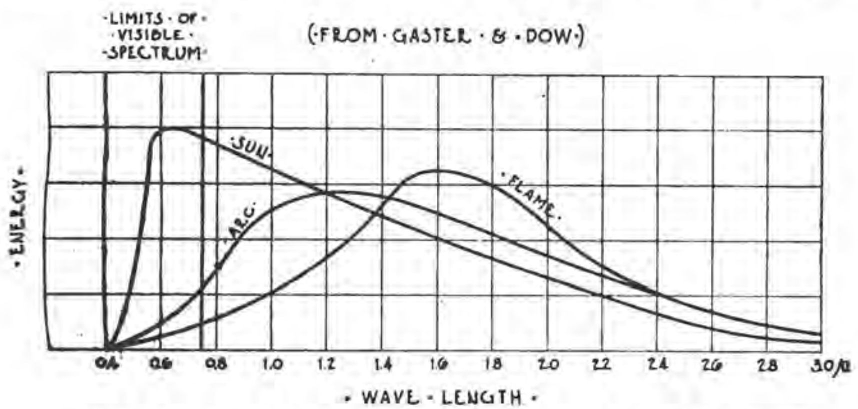
Petroleum lamp	0.25
Incandescent gas, upright	.46
Incandescent gas, inverted	.51
Electric incandescent lamp:	
Carbon filament	2.07
Tantalum filament	4.87
Tungsten filament	5.36
Arc lamps, direct current, inclosed	1.16
Arc lamps, open	5.6
Arc lamps, flame	13.2

This waste is chiefly in the infra-red with incandescent sources and tends to decrease, relatively, as the temperature is raised. This may be seen by comparing, say, an ordinary electric stove with carbon and tungsten filament lamps, respectively. At first only "heat" rays are emitted; with increasing temperature red rays appear; then others of

[1] "The Physiological Aspects of Illuminating Engineering." Percy W. Cobb. Johns Hopkins Lectures on Ill. Eng., 1910.

greater frequency are added—the longer rays still being present—until at the temperature of the tungsten filament the light approaches "white."

It is possible, however, to secure increased efficiency in some degree by the use of substances which exhibit "selective radiation," irrespective of the above law; the tungsten filament, for example, shows this tendency to a certain extent, though its brilliancy and so-called "efficiency" are chiefly due to high temperature.[1] And it may be pointed out here that the use of the word "efficiency," as commonly applied to lamps, is somewhat misleading, for a lamp may be *run* at any rate of efficiency. It is true, nevertheless, that the practical rating of a carbon filament lamp—watts per candlepower—is far below that of the "Mazda," for the reason that any great increase of tem-



Distribution of energy in the spectrum of the sun, arc, and flame (Langley).[2]

perature would almost immediately vaporize the filament. It is conceivable, however, that if lamps were very cheap and current very dear it might be more economical to run them at a somewhat higher "efficiency" than usual, their life being shortened accordingly. In actual practice a compromise is effected, and lamps are designed for a current consumption that will give them a life of, perhaps, 800 to 1,000 hours.

In the consideration of every system of artificial lighting there is one topic to which all authorities on illumination devote special attention; this is the somewhat intangible subject known as "glare." While the condition itself is, unfortunately, only too apt to be apparent, it is one that does not seem susceptible of ready definition; at any rate, it is designated by a variety of terms, such as "light out of place," "dazzling light," etc., but Cobb's definition—"embarrassment

[1] Modern Illuminants and Illuminating Engineering. By Leon Gaster and J. S. Dow. 1915.

[2] This chart, while sensibly correct, may not be drawn absolutely to scale. (T. W. R.)

of the eyes or vision associated with strong light sensation"—seems as concise and comprehensive as any.

While it is readily appreciated that exposure of the eyes to a brilliant light source will produce a sensation of glare, it is also necessary to bear in mind the fact that contrast plays a very important rôle in the causation of this effect. If, for example, a bare tungsten lamp be suspended in the middle of a large room with dark walls and otherwise unlighted, conditions favorable for the production of glare would be extreme, while if the same room had white walls and was flooded with daylight the presence of the lamp would be scarcely appreciable. It is said that the light of a candle may cause "glare" under such unfavorable conditions, while it is quite apparent that even the ordinary electric arc street lamp does not seem excessively bright if one glance at it in broad daylight. While I do not gather the impression that all authorities go quite so far in this matter, the following quotation is informing: "Some highly sized paper was placed before each subject in the position which would give the maximum annoying glare and the illumination was raised and lowered in the attempt to find a comfortable point. No such point could be found, and all subjects agreed that the glare was equally annoying from the lowest to the highest illumination." * * * The author "believes that the annoyance caused by glare from light sources is altogether a matter of contrast with their surroundings."[1]

It must therefore be obvious that glare is not only produced by direct observation of the light source itself but may also be produced by reflection, particularly if such reflection is "regular" rather than "diffused." An example of this may occur—and in my own experience has occurred—as follows: When reading in a stateroom with one's back to the air port there is apt to be a bright imperfect image of this light source reflected from the opposite wall, in such position that the eye constantly encounters it if momentarily raised from the book. This effect is due to regular reflection from the highly varnished surface, although the latter is decidedly blue. If, now, a large sheet of white blotting paper is placed on this spot the image and effect of glare disappear, though it is probable that the quantity of light reflected is no less than before; it is, however, much more completely diffused. Evidently the color and surface (comparative smoothness) of walls has a marked bearing upon this question.

So far as the discomfort due to contrast, *per se*, is concerned it seems that this arises from the fact that the eye does not and can not adapt itself sufficiently to rapid extremes of intensity. If our pupils are contracted under the influence of a high general illumination (e. g., daylight) it is evident that the interior of the eye will be

[1] "The Effectiveness of Light as Influenced by Systems and Surroundings." J. R. Cravath., Tr. Ill. Eng. Sc., VI. No. 8, November, 1911.

protected and less sensitive when we glance at a brilliant lamp. If, on the other hand, our eyes have been fixed upon a dark wall and the pupils are in consequence much dilated, sudden and frequent exposure to a light of comparatively high intensity must cause fatigue and distress. Hence "glare occurs only when a rested or sensitive eye experiences simultaneously a high intrinsic brilliancy and sharp contrasts." (Bohle.)

With modern illuminants the tendency is general toward the "higher efficiency"—that is, economy—which comes with increased intrinsic brilliancy, and if there is one point upon which all authorities are in complete agreement, it consists in emphasizing the necessity of avoiding bare lamps within the limits of vision; yet on shipboard we will find that the greatest laxity exists with respect to this very feature. In fact, the whole keynote to reasonable success in solving our illuminating problems lies in appropriate diffusion of light, which not only tends to prevent glare from the illuminant itself, but also that due to regular reflection from neighboring surfaces, which may, at times, be scarcely less annoying.[1]

From a consideration of such principles relating to "contrast" and "glare," it appears "that—in order to be able to rest the eye—we should supply two illuminations; a fairly high one for working purposes, * * * which is usually called local illumination, and a considerably lower one which allows the eye to rest from the high intensity and to recover increased sensitiveness. * * * The general illumination should, however, not be too low, as then the eye would experience glare when returning to the highly illuminated surface."[2]

But in the accomplishment of this purpose we should not be led to the opposite extreme and provide an illumination so flat and generally equal that shadows are practically eliminated. Under such conditions, in the absence of color contrasts, the eye would be constantly groping for details, no matter how much light was available; in fact, the effect would be much the same as that which exists in a mist or slight fog, extreme diffusion, with loss of seeing ability and consequent eye strain.

Now, the system of illumination employed on shipboard is mainly "direct lighting," which has certain well-known disadvantages, but before emphasizing these defects—which may be greatly minimized anyway—let us ask if any other system would be at all practicable, bearing in mind certain structural peculiarities inseparable from

[1] In one instance, in actual practice, it was found, in a factory, that the direct reflected light which reached the eyes of an operator who was at work on polished material was almost 40 per cent of the light which reached the object viewed. When this direct reflection was cut down by a change in the installation, the operator could see the work much better and with much less visual fatigue. (Marks.)

[2] "Electrical Photometry and Illumination." Herman Bohle, 1912.

naval design. In the first place, a ship's interior is greatly cut up into relatively small and irregular compartments, which are much encroached upon by their contents. There are no unobstructed ceilings, owing to deck beams, and free wall space is reduced to a minimum—conditions which make for heavy shadows and strong contrasts. Moreover, most living spaces on shipboard are used for a variety of purposes, either by the same persons at different times or, not infrequently, by a large number of different persons at the same time; provision must, therefore, be made in one and the same place for these varied requirements. In our dining rooms ashore, for example, we do not usually require more than a moderate general illumination, somewhat heightened over the table itself, but in a ship's wardroom, where many officers are at times engaged in reading, writing, or some kind of "near work," this would not suffice at all.

In considering the various systems of illumination the following recent classification will be convenient for the purpose of comparison:

1. General illumination by direct lighting:

(*a*) Lamps exposed to view.

(*b*) Lamps inclosed in globes or mounted behind a transmitting screen or septum.

2. General illumination by indirect lighting—primary lighting sources totally concealed from view and illumination carried out by reflected light:

(*a*) Cove lighting.

(*b*) Lighting by lamps concealed in opaque reflectors suspended from the ceiling.

3. Local illumination. Lighting carried out entirely by lamps placed to localize the light on the work.

4. General illumination by combination of direct and indirect lighting:

(*a*) Direct lighting units supplemented by indirect lighting.

(*b*) Indirect lighting units supplemented by direct lighting.

(*c*) Combination of direct and indirect lighting in the same unit.

5. Combination of general and local illumination:

(*a*) General illumination supplemented by localized lighting at places where a higher intensity of illumination is desired.

(*b*) Local illumination of such design as to provide general illumination.[1]

Evidently, general illumination by lamps concealed from view—indirect lighting—or combined systems, in which this is an essential feature, must be ruled out at once, for reflections from ceilings and walls on shipboard would be irregular, incomplete, and very inadequate as a primary dependence (though of great supplementary value in any system).

Referring to paragraph 1 of the above table, it would seem that no question could arise as to the relative merits of (*a*) "Lamps exposed to view" or "Lamps inclosed in globes or mounted behind a transmitting screen or septum," but, as already stated, there is no

[1] "The Principles and Design of Interior Illumination." B. L. Marks. Johns Hopkins Lectures on Ill. Eng., 1910.

actual uniformity in this respect on shipboard. Without further discussion at present, I think it will be apparent that our main reliance must be upon direct lighting "supplemented by localized lighting at places where a higher intensity is desired."

In this brief and elementary discussion, which, it is fully realized, has merely touched a very few of the "high lights" in a subject of immense scope, the purpose has been, in the main, to indicate lighting conditions we desire to approach, with the reasons therefor, having in mind subsequent comparisons with standards afloat.

In concluding this paper I can not, therefore, do better than quote the following excellent résumé of fundamental principles, entitled:

"SOME SIMPLE RULES OF GOOD LIGHTING."

Don't work in a flickering light. An unsteady, flickering illumination is extremely trying to the eyes.

Don't expose the eyes to unshaded lights in the direct range of vision. Glare from brilliant unscreened sources of light is prejudicial to eyesight and prevents you from getting the best results from the illumination provided. Lamps should preferably be placed fairly high in a room out of the direct range of light. If local lights, low down and near to the eyes of the worker, are used, they should be covered by a suitable opaque shade. Do not read facing the light.

Don't judge illumination by the brightness of the lamps. Do not think because a lamp looks glaring and brilliant that it is giving you a good light. It may be merely giving too much light in the wrong place. On the other hand, a well-shaded lamp may look dim because it is well shaded and may still be giving a first-class light to work by.

Avoid excessive contrasts. If you use a table lamp to provide a strong local illumination, do not leave the rest of the room in complete darkness. Provide a moderate general illumination.

Use the right type of globe, shade, or reflector. Some forms of globes and reflectors are intended to diffuse the light evenly in all directions; others concentrate the light mainly in one particular direction. See that you get the kind of shade which the local conditions demand. Avoid very shallow reflectors, such as only cover part of the lamp.

Make sure that the illumination is sufficient. Proper illumination should be provided on the spot where work is actually carried on; 2 or 3 foot-candles is usually enough to read by. More is needed for special fine work and when the materials to be illuminated are dark in color and reflect little light. Rooms with dark walls and ceiling require a greater illumination than those in which the surroundings are light in tint.

Keep lamps, globes, and reflectors clean. Accumulations of dirt on lamps, chimneys, globes, etc., absorb and waste a great deal of light.

Make sure that lamps are in the right position. When selecting the positions for sources of light, consider carefully what purpose they are to serve and remember the motto, "Light on the object, not in the eye." See that the light comes from the best direction and that it does not give rise to inconvenient shadows.[1]

---

[1] "Light and Illumination: Their Use and Misure." Illuminating Engineering. London, December, 1912.

MILITARY ORGANIZATION AND EQUIPMENT IN THE PRESENT WAR.[1]

By A. M. FAUNTLEROY, Surgeon, United States Navy.

When the medico-surgical history of the military operations of the Allies in France is written it will contain large reference to the different phases of the war as exemplified in the German advance, retreat, and entrenchment as having a direct bearing on the problems that had to be solved as they arose by the medical officers of the allied armies.

Germany's declaration of war on Belgium, France, and England in August, 1914, was followed by the swift and sure movements of her well-oiled and constantly cared for fighting machine, a machine which had been perfecting itself for over 40 years to meet just the conditions confronting it at the outbreak of hostilities. Before France and England realized that war was inevitable Germany had made certain overtures to Belgium and Luxemburg with reference to the passage of her troops over their neutral territory, as being apparently a part of a long-standing and well-matured plan of attack. Luxemburg being a negligible quantity, how far Germany realized or cared for the resistance that Belgium might offer only the archives of Wilhelmstrasse can answer. As to the political aspect of such a situation, involving the rights of neutrals, it is not within the province of the military surgeon to comment upon, beyond recording the devastation and almost total destruction of the country following Belgium's refusal to sanction any idea of a violation of her neutral rights by a belligerent. This condition of affairs at the very outset of the war taxed the available civil and military medical men far beyond their capacity to meet. The many thousands of refugees, numbers of whom ultimately succumbed to starvation and exposure, together with the rapidly increasing number of daily wounded, completely overpowered the relatively few medical men and nurses.

That Belgium's sturdy defense and stubborn resistance upset a number of Germany's calculations is now well understood. It is practically conceded by many military men that Belgium's stand at least saved France and had further far-reaching effects on Germany's future campaign. It is a matter of record that it was something over three days before France could mobilize a small army on the Franco-Belgian frontier, a fact that carries its own significance as regards any idea of French invasion of Germany through that quarter. When one realizes that, despite Belgian resistance, it took Germany only 29 days to get within big-gun distance of Paris, it is a matter of fairly easy speculation as to the outcome of their plans had they not been delayed in passing through Belgium. Long before

[1] Extracted from official report to the Bureau of Medicine and Surgery.

the final fall of Liege, Louvain, Brussels, Namur, and Mons five well-equipped German armies were straining at the leash, but could not afford to make the dash on Paris with an unconquered Belgium on their flank, which in a short time would also invite a serious menace to their lines of communication by allowing England the opportunity for an unobstructed landing in Belgium.

Having once adopted this method of invading France, instead of by way of the Franco-German frontier, the German forces vigorously engaged the French frontier garrisons and the defense all along the line, in order to prevent reinforcements being sent to the practically undefended Franco-Belgian frontier and also to feel out the strength of the French resistance. How well this plan succeeded and prevented French concentration on the scarcely defended western end of the frontier, is now a matter of history. Although French military preparation is organized along the lines of national service and enforced military training of three years with the colors, it is a much slower moving and less automatic machine than the German organization, besides being greatly outnumbered by the latter both on a peace and war footing. The economic conditions in the French Republic have always tenaciously pulled away from an energetic military policy in contrast to the Prussian military spirit which has dominated Germany for over 40 years, and upon which the entire economic structure of the Empire is built. Hence it is that Germany could much more rapidly mobilize her armies, with practically no disruption of her internal affairs, in contrast to France, or for that matter any other power, whose instincts for internal development constantly thwarted any ascendancy of a predominating military idea.

After Belgium had been practically subjugated, the concerted action of the German right and center, with their communications fully protected, gave the right wing under von Kluck the opportunity to continue the sweeping movement over northwestern France, to which the French and English could offer but sporadic resistance. The country over which this movement took place is open and gently undulating, the fields are large and for the most part unfenced, the splendid roads often run in a straight line for many miles, and altogether it is eminently fitted for the operations of large armies. So swift was the onrush, a French offensive could not be developed until August 25, a little less than two weeks after the Germans had begun to menace the northwestern territory. French and English mobilization and concentration could not keep pace with the oncoming Germans.

During this time the allied surgical fieldwork was an extremely arduous, not to say impossible, undertaking. The lines were constantly falling back, which allowed for practically no organization

for field-hospital work, or even the assembling of the wounded, much less caring for the dead. Scarcely would a regimental stand be made and allow the surgeons to form a hasty plan to group and succor the wounded, when the order would come to fall back. There was nothing to do but apply as many first-aid dressings as practicable to the wounded in the immediate neighborhood of a surgical unit, and then leave them on the field to care for themselves, where those who survived necessarily became prisoners.

On August 25, General Joffre issued an order of the day explaining that as it had been impossible to carry out the projected French offensive, a regrouping of forces would be necessary in order that, by the junction of the Fourth and Fifth French Armies and the British Army, and of forces drawn from the east, a mass of troops might be assembled in the region of Amiens which would be able to assume the offensive in a general direction toward Saint-Pol-Arras or Arras-Bethune. The same order arranged that this extensive movement of troops should be covered by rear guards, whose mission it was to utilize every advantage of ground to stop, or at least to retard, by means of short and violent counter attacks (principally with artillery), the march of the enemy.

From August 25 to September 4, this great movement was carried out, but the rapidity of the advance of the German right wing, coupled with transport and other difficulties and the congestion of the railways caused by the evacuation of Paris, compelled the troops assembling from the east to take positions more to the south than had originally been intended, and the French offensive was consequently delayed. On September 4, reconnaissances by the allied cavalry and aviators discovered that the German right had deflected its march on Paris toward Meaux and Coulommiers. By this time, however, what had been formerly the French left (Fifth Army) was ready to attack the front of the enemy's columns, and it was supported toward the northwest by the British Army and by the army sent out from Paris in taxicabs under General Maunoury, both lying northeast from Paris. Thus the massing of the forces ordered by Gen. Joffre on August 25 was accomplished. Instead of being enveloped, the French armies were now in a developing position, and the two wings being in contact with the fortified points of Paris and Verdun, the maneuvering of the whole body was greatly facilitated.

It was at this time that Gen. Joffre decided to pass to the attack, and on the evening of September 4 he issued another order of the day, as follows:

It is advisable to take advantage of the hazardous situation of the First German Army in order to concentrate upon it the efforts of the allied armies of the extreme left. All arrangements will therefore be taken on the 5th in view of an attack on the 6th.

The order of the day then gives detailed instructions as to the forces available and the directions in which they were to attack. The Sixth Army, then northeast of Meaux, was to cross the Ourcq toward Chateau Thierry and the available elements of the First Cavalry Corps were to be placed under the orders of Gen. Maunoury for this operation.

The British Army, established on the Coulommiers front, was to attack in a general direction toward Montmirail, while the Fifth Army, drawing slightly to the left, was to attack from the Esternay-Sezanne front, in a general direction from south to north. The Second Cavalry Corps was to insure communications between these two armies. The Ninth Army was to cover the right wing of the Fifth Army by holding the exits from the Saint Gond marsh and by bringing part of its forces to bear on the plateau north of Sezanne. All these different armies were to assume the offensive with the dawn on September 6. Supplementary orders were issued on September 5 to the French Third and Fourth Armies. They were informed that the French left would attack the First and Second German Armies on the morning of the 6th. They were to act in cooperation, the Fourth Army, stopping its southward movement, to oppose a stubborn resistance to the enemy, while the Third Army was to attack the enemy's left flank, which was marching west of the Argonne.

Finally, on the morning of September 6, Gen. Joffre issued a proclamation, which was not a tactical order, but rather an appeal to the devotion of the troops, as follows:

> At the moment when a battle upon which depends the salvation of the country is about to begin, it is right to remind everybody that now is no longer the time to look back. Every effort must be employed to attack and to drive back the enemy. Troops which can no longer advance must, cost what it may, hold the conquered ground and die where they stand rather than retreat. In the present circumstances no faltering can be tolerated.

This was the beginning of the battle of the Marne, the outcome of which has passed into history as the undoubted salvation of France and has acclaimed Gen. Joffre a master in the art of war who was equal at the supreme moment to the gigantic task imposed upon him by his country. In view of the events leading up to it and of its decisive character, and in view of the totally different work of the medical department in the subsequent fighting, it is thought to be worthy of more than passing notice in the eyes of military surgeons, and that the accompanying map and illustrations will not be without interest.

The Germans lost heavily in their rapid retreat both in personnel and matériel, and finally fell back to the strongly fortified positions which, with few exceptions, they occupy at the present time (Aug., 1915). The character of the fighting again changed when the Germans fell back on their intrenchments, and again the medical depart-

ment was called upon to meet a totally different problem. The present trench warfare is, with minor differences, practically a siege warfare, and the medico-military problems will be discussed under general fieldwork.

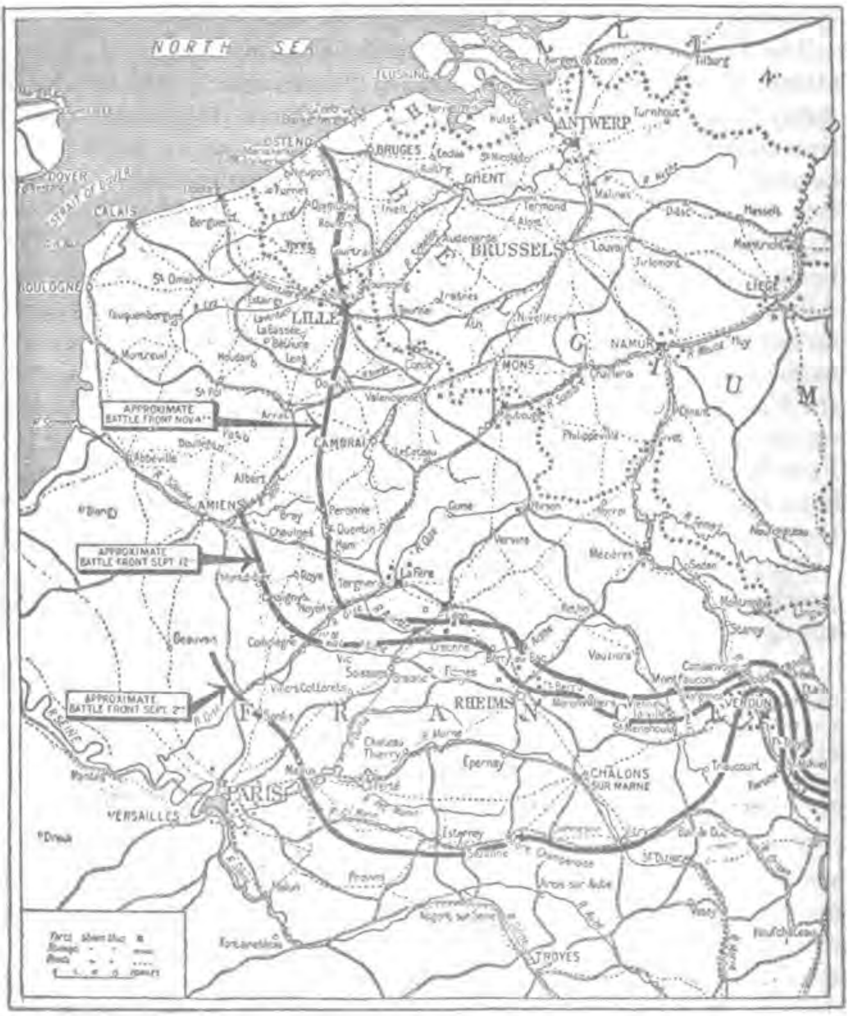


Fig. 1.—Battle front from North Sea to Verdun.

ORGANIZATION OF FIGHTING UNITS.

In order to get an insight into the strength, organization, and utility of the opposing forces in the field it is deemed advisable to offer the following brief outline. If one is to appreciate the medico-military aspect of fighting units there must be some understanding of the composition and division of an average standardized unit, whether large or small.

Infantry is organized into regiments, battalions, companies, and platoons, the strength of which vary considerably in different armies, and at different times in the same army. The standard infantry force may be said to be the battalion, which is now almost always composed of four companies and has the strength of about a thousand men. Some of the German battalions, however, on the outbreak of the war took the field with 1,200 or even 1,500 men. The battalion is commanded by a lieutenant colonel. Each of its four companies (numbering 250 men apiece) is commanded by a captain and subdivided into four platoons (each of about 60 men) commanded by a lieutenant or a second lieutenant.

In the French, German, and other Continental armies a regiment is composed of several battalions, usually three, though sometimes there are as many as six. The battalions of the same regiment in the Continental armies are commonly grouped together, and the whole regiment is commanded by a colonel. In the British Army the battalions of a regiment, which are usually two, rarely serve together, owing to the fact that one battalion in peace time is normally at home and the other on foreign service.

Cavalry is organized into regiments and squadrons. The strength of a squadron is 160 to 200 men, and a regiment is composed of from three to four squadrons. Consequently, a regiment of cavalry may muster anywhere from 400 to 800 men, but 480 men is a fair average strength. To these in the British Army must be added some 60 officers and men, among whom is the machine-gun section with two machine guns.

Artillery is organized into batteries, which are usually armed with six guns and have a strength of about 200 officers and men. The heavy artillery batteries, however, in some armies have only four guns, but these are of great weight and size. In the Continental armies the artillery is generally grouped into regiments, which include a large number of batteries, usually 10 or 12. In the British Army batteries are grouped into threes in the case of field artillery, and into twos in the case of horse artillery, which are called brigades. The strength of a brigade of field artillery is 18 guns with 795 officers and men. Of these about 200 officers and men form headquarters or are attached to the ammunition column which brings up supplies and ammunition.

The higher organization of troops is into armies, army corps, divisions, and brigades. An army is usually composed of several army corps. Thus Prince Ruprecht of Bavaria, commanding the Sixth German Army, has under his orders four army corps, totaling about 200,000 men. The English troops cooperating with the French in southern Belgium are known as the First British Expeditionary Force, under the command of Field Marshal Sir John French. This

force took the field with something over 150,000 men, and there have been numerous acquisitions since, until at the present time (Aug. 1915) there are close to one million British troops in France. This army, which has spasmodically grown since landing in France, has the same general organization as the other continental forces and is now composed of three armies, with the field marshal as commander-in-chief. To these must be added the small Belgian Army, now numbering about 100,000 men, under King Albert, which operates with the British and French forces in southern Belgium. These two groups of troops now hold a fraction over thirty-five miles of the front, while the remaining four hundred and odd miles of the line are held by the French armies, of which there are five in number,

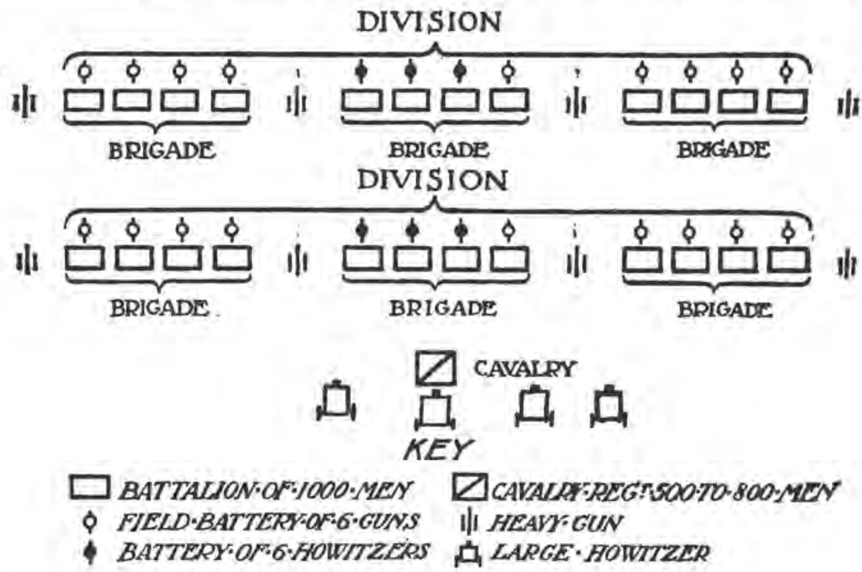


FIG. 2.—Standard unit of a British Army Corps.

having each very close to 300,000 men, with scattered reserves grouped at strategical points in the rear all along the line, numbering about 100,000 men, with reserve munitions and supplies. Gen. Joffre, the French commander-in-chief, is in supreme command of the allied line and of the so-called "zone of the armies," which latter extends back on an average of about thirty-five miles from the first line of trenches.

A brigade of infantry in the British Army is composed of four battalions and has a strength of 4,000 officers and men. In the German, and almost all other Continental armies, it consists of two regiments and not fewer than six battalions, so that its strength is 6,000 men or more. A brigade of cavalry consists of two regiments in the Continental armies and in the British Army of three; its

strength in either case is about 1,600 men. A division of infantry consists of two brigades in the Continental armies and in the British Army (fig. 2) of three brigades, with 54 field guns, 18 field howitzers, and 4 heavy guns (long 60-pounders). It has also attached to it engineers, signal-corps men, and transport. In the British service its strength is about 18,500; in the Continental armies it is between 19,000 and 20,000 when the ranks are full.

Two divisions in the British Army make an army corps, which is a force complete with infantry, cavalry, and artillery. Attached to the army corps are usually extra heavy artillery and cavalry, and

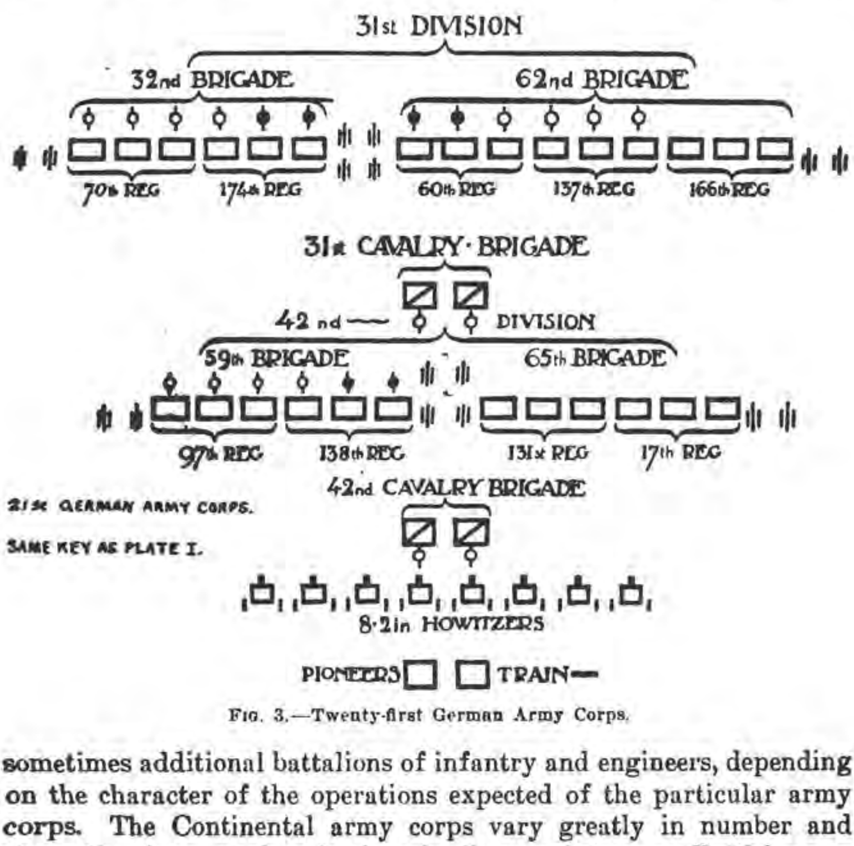


FIG. 3.—Twenty-first German Army Corps.

sometimes additional battalions of infantry and engineers, depending on the character of the operations expected of the particular army corps. The Continental army corps vary greatly in number and strength. A comparison is given in diagram between a British army corps of standard organization and the Twenty-first German Army Corps (fig. 3), as the latter was organized in time of peace. The Twenty-first Corps was stationed in Alsace-Lorraine, but was later transferred to the Russian frontier. It will be observed that it is distinctly stronger than a British army corps. In the Austrian Army at the outbreak of the war the army corps were even stronger than the Twenty-first German Army Corps, as they each mustered

three divisions, bringing them up to nearly 60,000 officers and men, and one or two of them even had four divisions, thus totaling nearly 80,000 men, or the strength of a large army in Napoleon's day. The general opinion is that these overgrown corps have now been split up into more manageable organizations.

At the beginning of the war there was a marked difference in the number of machine guns of the opposing forces, the Germans outnumbering the Allies eight to one. At the present time, one year from the beginning of the war, the machine guns are about equal on both sides in the different units. While shrapnel shells were largely used on both sides during the first months of the war, the Germans quickly substituted the high-explosive shell when the entrenched phase of the battle line began. At the present time the Allies have almost entirely given up shrapnel in favor of the high-explosive type of shell, sometimes including shrapnel, of which a more detailed discussion, and of the wounds they cause, will be presented later on under the appropriate heading.

FIREARMS, PROJECTILES, AND OTHER MEANS OF INFLICTING WOUNDS OBSERVED IN THE PRESENT WAR.

A comparison of the small arms of the belligerents in the western European arena will serve not only to indicate the effectiveness of the weapon under certain conditions, but will throw considerable light on the character of the wounds inflicted; particularly when consideration is given to the character of the fighting as regards range, entrenching operations, open fieldwork and "sniping." Certain conditions and factors during the present war have led to relegating the rifle to a comparatively insignificant place in the art of maiming or crippling the activity of large groups of men.

The close contact of well constructed and protected opposing trenches, the development of the hand grenade, bomb, high-explosive shell, shrapnel, machine gun, and asphyxiating gas have all combined to greatly limit the usefulness of the rifle in the eyes of the modern military man. There is no doubt of its usefulness, however, in the hands of an alert sharpshooter when a target presents itself either in trench work or in "sniping"; and its moral effect is not to be overlooked as a means of thereby subduing the enterprise of opposing troops in close contact.

As a most valuable and inseparable adjunct to the rifle, after the artillery has prepared the way by breaking up the barbed wire and other obstructions, the use of the bayonet in carrying a position has been a weighty factor during the operations of the present war. The French bayonet, which is triangular on cross-section, needle pointed, fluted and with one or more cutting edges, is considerably longer

(4 to 6 cm.) than any of the other bayonets. The English and continental armies employ a knife bayonet which takes the form of their respective hunting knives. According to trustworthy reports from all along the front, the French and English are using their bayonets much oftener and with more deadly effect than the Germans.

	Rifle.				Projectile.					
	Caliber.	Weight.	Sighted to—	Name.	Coating.	Core.	Length.	Weight.	Propelling charge.	Initial velocity.
	Mm.	*Kg.*	*Meters.*				*Mm.*	*Gms.*	*Gms.*	
France........	8	4.2	2,400	Lebel...	Solid....	Copper..	30.3	13	2.9	700
Germany.....	7.9	4.1	2,000	Mauser..	Steel....	Lead....	28	10	3.2	860
England......	7.7	3.8	2,540	Lee-Enfield.	Nickel..	...do....	32.1	14	2.6	605

These projectiles are fired by a smokeless powder which increases their velocity, and at the present time are cylindro-ogival, having previously been cylindro-conical. The length of the bullet has increased from former times, whereas the weight has diminished. As regards the latter it has fallen from about 25 grams to 13 grams (ball D, French) and 10 grams (ball S, German). The caliber of the rifle has fallen from 11 mm. to about 8 mm., and even to 6.5 mm. (Italy).

The French bullet (ball D) (fig. 8), on account of its high sectional density, maintains a relatively high remaining velocity at extreme ranges. While it is subject to considerable deformation on impact against a hard substance, and while it produces the characteristic "explosive effect" at certain ranges, it very rarely, if ever, is subject to fragmentation.

The German bullet (ball S) (fig. 9), on account of its lower sectional density, and in spite of its higher initial velocity, is ineffective at ranges at which the French bullet is still dangerous. Ball S, as is the case with all jacketed bullets, not only produces characteristic "explosive effects" at certain ranges, but is subject to deformation and fragmentation when striking hard objects. Fragments of the jacket or contorted forms will often be found in the tissue adjacent to bones shattered by the impact of the bullet. If the point of a jacketed bullet be cut off, or if the bullet be reversed in the cartridge before firing, "mushrooming effects" will be produced, which are very disastrous to tissue (figs. 7 and 10). The lead core of the English and German bullet is uncovered at the large end.

On the other hand, at long ranges, if the bullet has not been deformed by ricocheting or otherwise, comparatively small destruction of tissue is usually noted, as the velocity is very much reduced, caus-

ing wounds of entrance and exit of about the same size, or the bullet lodges in the tissues (figs. 11 and 12). Sometimes, although rarely, even at close range, the same phenomenon of small wounds of exit and minor destruction of tissue will be produced, although bone may be fractured. On account of certain conditions and factors, which have never been satisfactorily explained, the bullet at an extreme long range will not infrequently cause wounds showing an "explosive effect"; and hence there seems to be a certain indefinite zone, between short and extreme long ranges, in which the bullet does not produce the marked "explosive effect" usually noted for these two ranges.

The English bullet (fig. 6) is characterized by its very high sectional density and relatively high remaining velocity at extreme ranges. The effects of this bullet are similar to the German bullet, although it is to be noted that it is not as distinctly sharp pointed as the ball "S."

Unless the bullet is deformed by ricochet, strikes sideways, or butt-end-to, it is rare to find particles of clothing carried into the wound, in contrast to shrapnel, shell, and hand-grenade wounds, which are practically always infected from the pieces of clothing and dirt driven deep into the tissues. The effects of rifle-ball wounds of long bones will be seen elsewhere in this report, in connection with the notes under the photographs and X-ray pictures. Penetrating and perforating wounds of the abdomen, brain, and other vital organs will be noted in connection with the report on fieldwork.

There are a number of factors which have a bearing on the character of the wound inflicted by the cylindro-ogival rifle ball, of which the German ball S is a type. At extreme ranges it is not unusual to find the bullet lodged in the tissues, giving rise to practically no trouble unless situated in a particularly sensitive region. If the soft parts only are involved, the wound of entrance and the channel are of the same size as the undeformed bullet. In general terms, it may be said that the closer the range the less liability there is of the bullet lodging in the tissues and the greater the tendency to exhibit "explosive effects" in the wound. Thus, when there is a wound of entrance and exit the latter is usually larger at close ranges and the track of the bullet through the tissues is funnel shaped, with the small end of the funnel at the wound of entrance. This is due to two factors: First, the inability of the tissues to separate quickly enough to allow the high-velocity bullet to make a channel without pushing some of the tissue it traverses ahead of it and thus enlarging the channel toward the wound of exit; secondly, when compact bone is in the path of the high-velocity bullet it almost invariably causes a certain degree of comminution and the smaller bony fragments act

as secondary missiles to enlarge the channel toward the wound of exit. When comminution of bone takes place it is also usual to find many of the smaller pieces driven deep into the tissues adjacent to the bone.

As not infrequently happens, a bullet may be deflected from its original course by contact with the denser tissues, such as fascia, cartilage, or bone, and when a bullet "tumbles" in its flight, causing a lateral or butt-end impact, the character of the wound of entrance is different than when the tissues are penetrated by the sharp end of the bullet. The larger the surface of the bullet exposed to impact the greater will be the immediate destruction of tissue, though the penetrating effects will be greatly reduced, and thus a bullet may even lodge in the tissues at comparatively close ranges.

When a rifle bullet, such as the German or English, becomes deformed by striking a hard object before actually penetrating the tissues, the outer coating of nickel steel may become distorted, and even entirely separated from its core of lead, upon impact with the body, and there may be fragmentation of both jacket and lead core, causing a lacerating and destructive wound of the deeper tissues (figs. 15–17).

The contact of a high-velocity bullet with dense bone not infrequently causes deformation and fragmentation of the bullet and usually comminution of bone. The cancellous ends of long bones are usually perforated without fragmentation or splintering. While the splintering or comminuting effects of the high-velocity bullet on the shaft of long bones may sometimes take the form of specially descriptive fractures, such as "butterfly," "stellate," etc., it very frequently happens that there are no special lines of cleavage to be noted but simply an irregular comminution. The French bullet (ball D) being solid copper, as already indicated, does not undergo fragmentation.

A bayonet wound is a penetrating or cutting stab wound usually of the abdomen, chest, or groin, and in not a few instances is multiple. The character and result of this wound will be mentioned later in connection with fieldwork. Sabers are used for thrusting or slashing, and the wounds they inflict are usually multiple. The saber wound is usually in the region of the head, right elbow, and left upper arm. The cavalry lance is a long thrusting implement propelled with considerable force and aimed at the trunk. The French lance has a head of quadrangular section, 15 cm. long and 2 cm. in diameter. The German lance has a triangular head 30 cm. long and 15 mm. in diameter. Lance wounds are almost invariably in the trunk. As the bayonet, saber, and lance are only used in hand-to-hand conflict, which is a particularly ferocious kind of fighting, the fatality accompanying these wounds can readily be understood, since it is usually a fight to the finish between the troops engaged. Wounds from these thrusting implements have tended to increase as the war has progressed. In

1870 there were only 600 cases of thrust wounds out of 98,000 wounded (Delorme), while at the present time Gen. Delorme, of the French medical service, estimates that they comprise 5 per cent of all the wounds.

Pistol wounds in this war are extremely rare. The French and German officers are provided with an automatic pistol of the same general type as is provided in the American Army. In instances where these wounds have been treated they have shown a marked "explosive effect," especially when bones were involved.

Thin steel helmets are now universally used by the Germans in the trenches. The French cavalry have also worn this form of headgear for many years, together with a thin steel cuirass protecting the chest and abdomen. The French have adopted a steel helmet 7 mm. thick, which is now being worn by their troops in the trenches. It is believed that it will considerably limit the number of head wounds in the present character of fighting.

GRENADES.

The offensive by sapping has brought the Allies' and German lines, in the present trench warfare, into very close contact. In some instances the opposing trenches are only 5 to 10 meters apart. The depth of the trenches and the protection they afford are such as to render rifle fire of very little value in storming the occupants. Since the trenches are so close together in the first line that neither side can use artillery freely without greatly endangering their own troops, grenades have assumed a very important rôle in this character of fighting, and so much so that at the present time under certain circumstances, they are the principal means of putting a section of trenches out of action. On this account, and on account of the severe wounds they inflict, their use and study is of special interest to the military surgeon.

When the opposing trenches are farther apart an infantry attack can be delivered with minimum loss if the barbed-wire and other obstructions have been destroyed by intense artillery fire and by the explosion of mines in connection with sapping operations. In this manner breaches are made in the accessory defenses and allow the charging troops to reach the enemy trench. To put out of action quickly the last defenders of the trenches attacked part of the assaulting troops are provided with hand grenades or bombs. These missiles are thrown at the enemy over the barriers that may have been erected and into the firing and connecting trenches, all parts of which it has not been possible to capture at once.

There are several types of grenades in use by the opposing forces which are furnished the troops in the field. In addition to these the troops themselves extemporize various kinds from the material to

be found at the front. The hand grenade furnished to the French troops is the bracelet type (figs. 18 and 19), with automatic firing mechanism, consisting of a ball of cast iron filled with a high explosive and of a leather bracelet fastened to the wrist. To the bracelet is attached a rope about a foot long, having an iron hook at the end. Just before throwing the grenade the hook is engaged in the ring of wire attached to the friction primer forming a part of the fuse plug which closes the iron ball. Thus when the grenade is thrown the ring of wire and friction primer are wrenched off and the fuse is fired. This grenade can be thrown about 25 meters, and explodes four or five seconds after the primer has been released.

The German grenade can be thrown by hand or rifle (figs. 20, 21, and 25). By hand it is used for short distances, 15 to 20 meters. It is composed of a copper rod to the extremity of which is fixed a cast-iron cylinder filled with a high explosive and grooved in order to facilitate its breaking into small pieces at the moment of explosion. A copper tube, also containing some explosive, is placed in the interior. It is surmounted by a complicated system for closing the grenade and for automatic firing by percussion, which is said by the French to result in a large percentage of misfires. In quite a number of instances the British troops have hurled back these grenades into the German trenches. Used with the rifle, this grenade has a maximum range of 400 meters. When so used a blank cartridge is placed in the chamber of the rifle and the quantity of powder left in the cartridge is regulated according to the distance to be thrown. The Germans, like their opponents, make use of a large number of extemporized grenades. The assaulting troops carry them in haversacks or strung in a circle of wire around the shoulder or waist (figs. 22–26).

The grenade wounds, besides the usual great destructive effects (fig. 23), are always infected wounds, the fragmented casing carrying into the tissues particles of clothing and dirt, and resembling in this and other respects the shrapnel and shell wounds. It would be difficult to estimate the range of effectiveness of a fragmented grenade since their use only contemplates an explosion at close quarters in a restricted area, such as the modern zigzag and communicating trench. Hence it is that only the occupants of a small section of trench are injured by the fragmented projectiles. These weapons exert a considerable moral effect owing to the violence of the explosion and the great mutilation of face and body which they occasion. A premature explosion of the manufactured grenade is prevented by rendering it innocuous except in the act of throwing, which latter releases the safety pin or ring and either starts the fuse burning or converts the grenade into a contact explosive, causing the charge to burst on impact with earth, water, or snow.

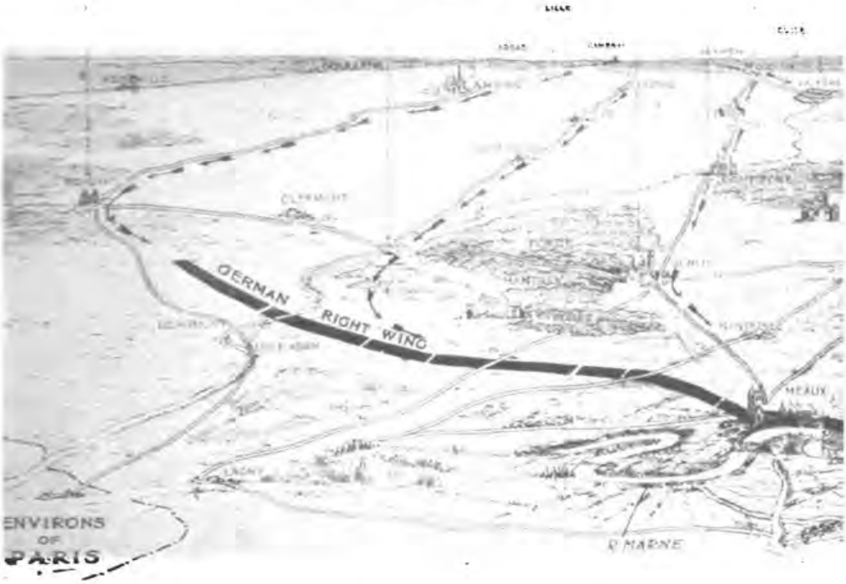
The *minenwerfer*, or trench mortar, first introduced by the Germans in the early fighting around Ypres, is another means of hurling a large amount of high explosive into an opposing trench. As used by the Germans, it is said to have a range of 350 yards and throws a thin-walled shell weighing 187 pounds, the latter having an explosive effect only. In construction it is built along the lines of a catapult and light enough to be drawn by two men. In addition to this weapon, crude arrangements have been employed on both sides to throw a large charge of high explosive for the purpose of destroying barbed-wire entanglements and other obstructions. The underground (sapping) trench has also been used extensively for the same operations on a larger scale. Aerial bombs, either incendiary or high explosive, are likewise used, principally for the bombardment of supply depots, railroad stations, and towns. The French aviators also drop steel darts on troops in the open. These darts are about the size of a pencil, 5 inches long, sharp pointed, and grooved so as to keep the missile vertical in flight. A thousand darts are dropped at a time from a great height and are said to scatter over an area of 200 yards.

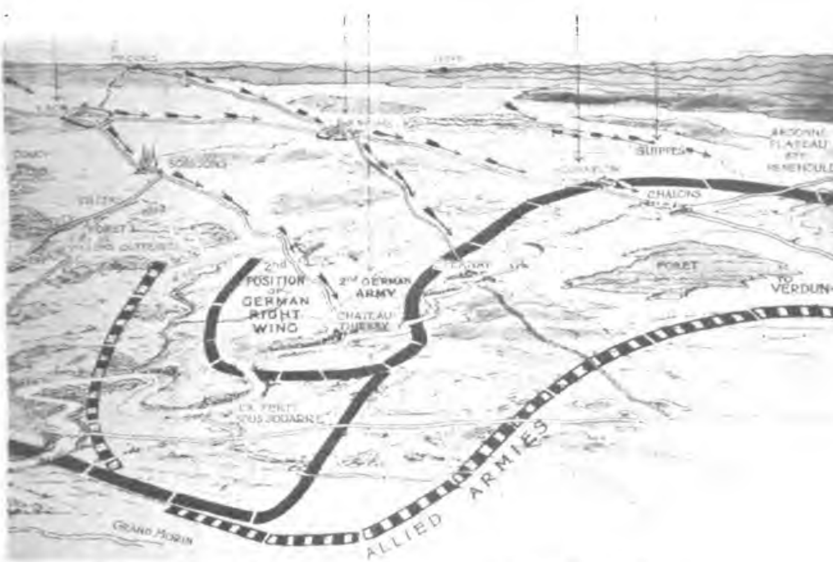
MACHINE OR RAPID-FIRE GUN.

While the rifle is still the infantryman's principal weapon, the machine gun is playing an increasingly important rôle in the conduct of the present war. At the beginning of the war the Allies were markedly deficient in this arm, but at the present time there seems to be no advantage on either side in this respect. Organized rifle fire is directed in various ways, according to the conditions to be met. Thus we have "distributed frontal fire" along the entire line of an advancing body of men; "concentrated fire" on a particular spot for a definite reason; "oblique fire" from one portion of a trench while the other portion is occupied in the assault; "enfilade fire" when a trench or body of men is fired upon from their flank; and "covering fire" when reserve troops situated on high ground fire on the enemy trench over the heads of their comrades in front.

The rapid-fire gun, while not a new idea, has been greatly improved upon since Dr. Gatling's American Civil War invention. It is far superior to the rifle for repelling a charge, either by direct or enfilading fire, in defending trenches. While normally mounted on a tripod and manipulated by two men, it is also being largely used mounted on a mortorcycle or autocar for a reconnaissance in force.

The Maxim machine gun (fig. 4) is the type used by all at the present time, each country having a slight modification of its own. It has a single barrel which is kept cool by either a water jacket or by air radiation, and is entirely automatic in its action. This latter





COULOMMIERS LA FERTÉ GAUCHER.

FIG. 5.—DIAGRAMMATIC BIRD'S-EYE VIEW OF THE ADVANCE OF THE GERMAN ARMIES ACROSS THE PLAINS OF FRANCE TO THE TURNING POINT ON THE MARNE.

The Allies retired in the first week of September, 1914, before the advance of the Germans, along the main roads indicated by the black arrows. From Cambrai the Germans pushed through Amiens to Beauvais about September 2. From Peronne they marched on to Roye, Montdidier, Creil, and the Forest of Chantilly. From the region of Le Cateau and St. Quentin the advance was by Noyon to Compiègne, at which point they had to fight for every inch of ground. They then passed through Senlis down to Meaux. Laon, though heavily fortified, was relinquished by the Allies during their retirement; and the enemy advanced thence to Soissons and Chateau Thierry. Farther to the east the invasion from Mézières passed by Rheims to Épernay, Mourmelon, and Châlons. Another force coming from the direction of Longwy appeared to be operating through Suippes and on the wooded Argonne Plateau, with its five passes famous in the action in 1792 which preceded the dramatic battle of Valmy. The vertical arrow lines signalize the points of importance in the German advance.

Fig. 6.—Actual size of English cartridge. (See page 44.)

Fig. 7.—Wounded (200 meters) while running, showing smaller wound of entrance and larger (explosive) wound of exit, causing multiple fracture of tarsus and opening up the ankle joint. (See page 43.)

Fig. 8.—Actual size of French cartridge "D." (See page 43.)

Fig. 9.—Actual size of German cartridge "S." (See page 43.)

Fig. 10.—Bullet striking jaw at close range (30 meters), causing multiple (explosive) fracture, with considerable loss of substance, and continuing on through neck and shoulder. (See page 43.)

Fig. 11.—Wounded at something over 1,500 meters, through soft parts only. Entrance and exit about the same. (See page 44.)

Fig. 12.—Wounded at medium range. Entrance over ninth rib, midaxillary line, right side. Exit over sixth rib, left side anteriorly, causing rupture of right rectus muscle and quick development of large ventral hernia. Abdominal cavity not entered. (See page 44.)

Fig. 13.—Wounded at extreme range. Entrance just above right zygoma and 2 cm. in front of tragus, passing beneath both eyeballs and lodging in the body of left malar bone, just beneath the skin. Practically the only symptoms were a periodically persistent nose bleed and extreme tenderness over left malar bone. (See page 44.)

Fig. 14.—Shows X-ray picture of undeformed ball lodged in left malar bone of same case as figure 13.

Fig. 15.—Showing loose fragments of bone in rifle-ball wound of forearm. Fragments were driven a considerable distance into surrounding tissue. (See page 45.)

Fig. 16.—Showing varying degrees of deformity and fragmentation of the German bullet "S" which were removed from different parts of the body. (See page 45.)

Fig. 17.—Showing X-ray of rifle-ball wound of middle of arm, and the deformation and fragmentation of lead core and steel jacket of a German ball "S," with great comminution of bone and marked secondary missile effect. The drainage tube shown in the picture was introduced at a field hospital after removing the first-aid dressing. This wound occurred at close range. (See page 45.)

Fig. 18.—Showing the regulation French bracelet type of hand grenade and a number of extemporized types, such as the "racquet" and "jam-tin." (See page 47.)

Fig. 19.—Showing a French soldier in the act of throwing a grenade. (See page 47.)

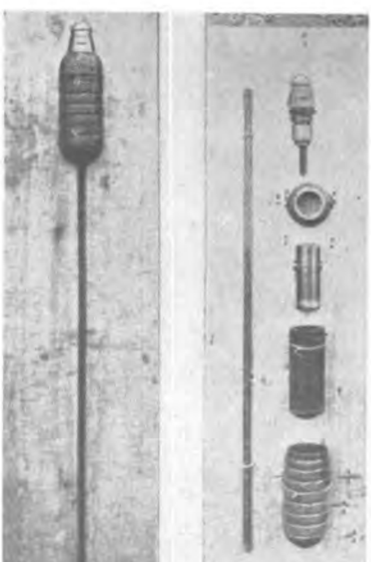


Fig. 20.—Showing German combination grenade. (See page 47.)

Fig. 21.—Showing grenade wound of right foot, from which the fragments in figure 25 were removed at base hospital after preliminary operation in field hospital. (See page 47.)

Fig. 22.—English combination grenade used in a rifle. (See page 47.)

Fig. 23.—Showing great mutilating effect of grenade wound of face with loss of right eye. (See page 47.)

Fig. 24.—English combination grenade. (See page 47.)

Fig. 25.—Showing actual size of fragments of a German grenade removed from foot. (See figure 21.)

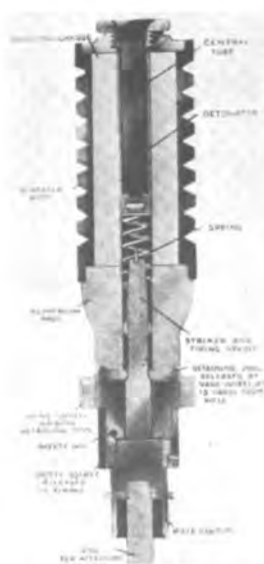


Fig. 26.—Longitudinal section of a recent grenade invention used by the English. (See page 47.)

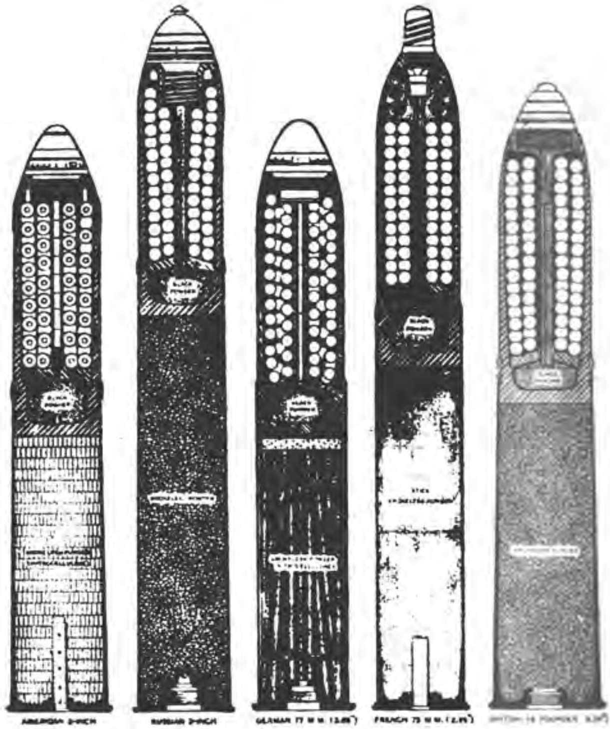


Fig. 27.—Types of shrapnel in modern use.

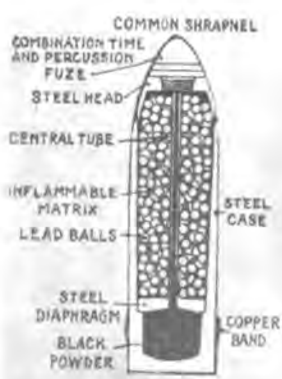


Fig. 28.—Common shrapnel.

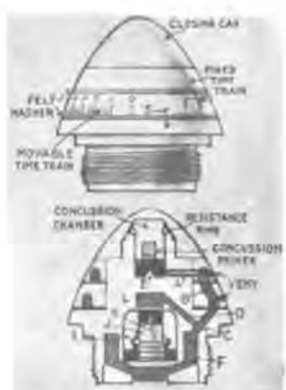


Fig. 29.—Fuse used in common shrapnel. (See page 55.)

Fig. 30.—Actual size of shrapnel bullets, pieces of shell, and a German bullet (upper right-hand corner) removed from wounds, and (lower left-hand corner) an English and French bullet for comparison. (See page 56.)

Fig. 31.—Penetrating shrapnel wound of thigh with fracture of femur. (See page 56.

Fig. 32.—This illustrates a shrapnel wound of right arm with considerable destruction of tissue and loss of substance. (See page 56.)

Fig. 33.—Shrapnel wound of face, with multiple fracture of lower jaw and considerable loss of substance. (See page 56.)

Figs. 34-35.—Showing front and side views of high-explosive shell wound involving entire loss of lower jaw and great destruction of tissue. (See page 56.)

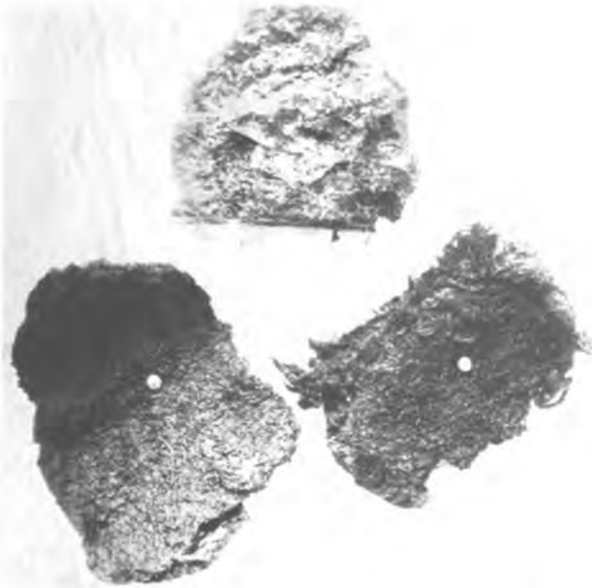


Fig. 36.—Actual size of piece of shell (above) and two pieces of cloth (below) removed from a shell wound of the back, showing some fibers of clothing still clinging to piece of shell. (See page 56.)

Fig. 37.—Actual size of fragment of high-explosive shell removed from lower jaw. (See page 56.)

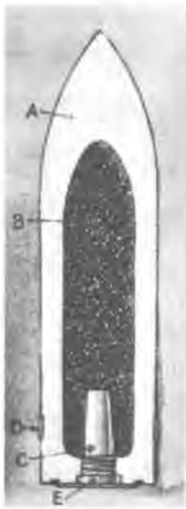


Fig. 38.—A high-explosive shell in cross section. (See page 56.)

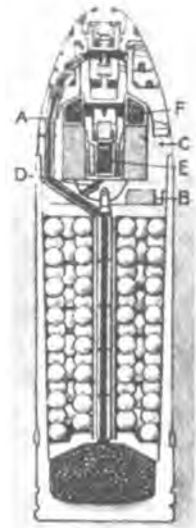


Fig. 39.—A type of the high-explosive shrapnel. (See page 57.)

Fig. 40.—Smaller fragments of high-explosive shell (actual size). (See page 56.

Fig. 41.—Small pieces of shell (above) and fragmented bone (below) removed from arm. (See page 56.)

Fig. 42.—Compound comminuted fracture of elbow joint, with great loss of substance, the result of a high-explosive shell wound. (See page 56.)

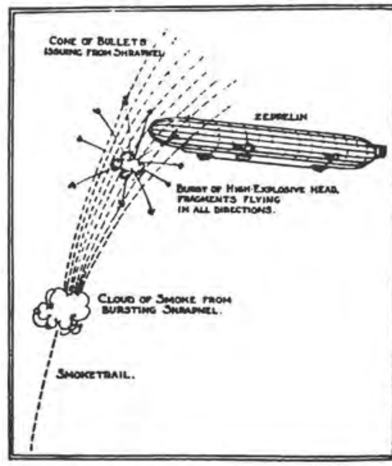


Fig. 43.—Generally considered the best projectile against Zeppelins; a high-explosive "universal" shell bursting, with fragments flying in all directions. (See page 57.)

Fig. 44.—High-explosive shell wound of right shoulder, with entire loss of deltoid muscle and complete shattering of upper half of right humerus; but the larger blood vessels and nerves were uninjured. The wound was infected and there were numerous large sloughs in different parts of the wound. Received four days after receipt of injury, and first dressing had not been removed. A large number of small fragments of bone were removed in this case, and under wet dressings and overhead extension the wound rapidly cleared up; the patient was completely comfortable and could be dressed without pain. (See page 56.)

Fig. 45.—X-ray picture of preceding case, showing the destructive effect on the humerus and small particles of shell and bone in wound.

48—14

Fig. 46.—A French "75" cannon which passed through seven months' campaigning.
(See page 59.)

Fig. 47.—One form of mask fitted on cap to the right and pattern of mask to the left.
(See page 60.)

means that after the first shot it will continue to fire at a very rapid rate (400 to 550 shots a minute), all the necessary operations of loading and firing being worked by either the recoil or by the pressure of the exploding gases within the barrel. They are built to take only the regular service rifle cartridge used by the troops, and these are fed to the gun by means of a belt carrying usually 250 cartridges.

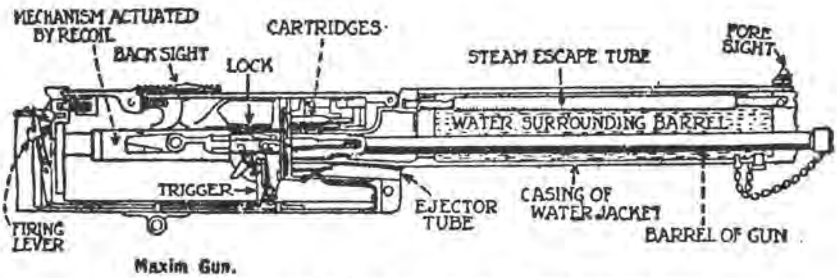


FIG. 4.—Showing longitudinal section of a Maxim machine gun.

Although the entire gun, which can be easily folded for transportation, weighs only about 70 pounds, yet one great drawback to its more general use is that it consumes an enormous quantity of ammunition. It also requires two specially trained men to operate. The wounds caused by this gun are, of course, the same as those from the service rifle.

ARTILLERY.

The artillery used by the opposing forces, with the exception of the light fieldpieces, has been undergoing various changes since the war began, to suit the varying conditions along the entire front. In the early part of the war, with the exception of the large siege guns and mortars used to reduce the Belgian fortifications, the light mobile field guns were almost exclusively used on both sides. These were the 75-mm. of the French, the 77-mm. of the Germans, and the 3.29-inch of the English. Shrapnel was largely used in these projectiles at that time, as the present obstructive and trench warfare did not develop until the German retreat and entrenchment after the battle of the Marne. Besides the field artillery mentioned, the French are now using a 90-mm., 105-mm., 120-mm., 155-mm., and a 220-mm. long and short. The heavier guns of the Germans are the 105-mm., 130-mm. (light howitzer), 150-mm. (heavy howitzer), 210-mm. (light mortar), and the heavy siege guns, 380-mm. and 420-mm. The English (in addition to the 3.29-inch) are using a 5-inch (120-mm.) howitzer and several higher caliber naval guns mounted for land operations.

While the larger cannon are used on both sides for long-range work and for special reasons, the "75" (French), "77" (German), and "3.29" (English) have been by far the most generally used

throughout the war. The reason for this is on account of the superior mobility and quick-firing feature of these pieces. There has been a good deal of rivalry during the last decade, in the different countries, in developing superiority in the light fieldpieces, and while the general mechanism of each is about the same, there are certain minor differences which each country thought the best, which changes were closely guarded. The recoil after firing in each of these fieldpieces is taken up almost entirely by a combination hydraulic and hydropneumatic system, which prevents the recoil being transmitted to the carriage, and the latter therefore does not have to be put into position after each shot. This arrangement admits of quick firing with accuracy.

BALLISTICS.

As there is no doubt that the field artillery is playing the dominant rôle in the present war, it is thought that a few words and sketches on ballistics would not be out of place. This is to be followed by a

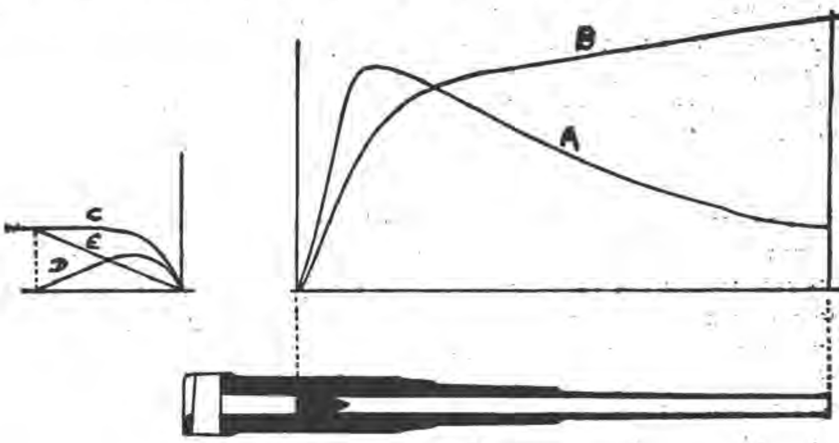


FIG. 48.—For description see text.

description of the projectiles which cause the great majority of the mutilating wounds, and therefore should be of interest to the surgeon. Ballistics is that portion of the science of gunnery which relates to the motion of projectiles. Interior ballistics relates to the motion of the projectile in the bore of the gun, and until the maximum or initial velocity is attained. Exterior ballistics relates to the motion of the projectile from the muzzle of the gun to the point of fall or impact.

INTERIOR BALLISTICS (fig. 48).— A3-inch 50-caliber quick-firing gun is shown in vertical longitudinal section, with the projectile in its position at the moment of discharge. Upon the ignition of the powder charge, the combustion of the powder proceeds with regularly increasing velocity, evolving gas under high pressure, which

exhausts its energy in imparting motion to the projectile. As the projectile moves along the bore of the gun, the space containing the gas increases until a point is reached at which this space exactly compensates for the evolution of the gas and this is the point of maximum pressure (curve A). From this point on the pressure of the gas upon the base of the projectile decreases until the projectile leaves the muzzle. The projectile starting from rest (curve B) acquires velocity first with increasing and then with decreasing acceleration until a short distance beyond the muzzle, where it attains its maximum or initial velocity. During this motion along the bore of the gun, the projectile is in engagement with the rifling which latter forces it to revolve about its longitudinal axis, this rotation being necessary to insure stability of the projectile during flight. Action and reaction being equal and opposite, as the projectile moves forward under the impulsion of the powder gas, the gun, due to similar pressure upon its breech block, recoils and if left free would attain a maximum velocity proportionately less than that of the projectile on account of its greater weight (curve C). The recoil is checked by hydraulic and hydropneumatic brakes which offer uniform resistance (curve E), and the gun is brought to rest on its carriage after a fixed length of recoil (curve D).

The curves of pressure and velocity (A and B) may be determined by a variety of methods and by the employment of a variety of instruments. If either be determined experimentally, the other may be derived from it by computation. These curves are only of interest, however, in connection with problems of gun construction.

The maximum pressure is generally determined by the use of the crusher gage (fig. 49). This consists of a steel cylinder A, in which is placed a copper cylinder B of known dimensions, held between a gas-tight piston O and the base of the cylinder. The gage is inserted in the powder charge and is subjected to the pressure of the powder gas. The result of the gas pressure is to crush the copper cylinder to a length C proportional to the pressure. As the reduction of length of the copper cylinder for any given pressure may be determined experimentally, a simple measurement of its final length will disclose the maximum pressure in the chamber of the gun.

The initial velocity is determined by means of the ballistic chronograph (fig. 49). In this instrument a rod D is suspended from an electromagnet, the induction coil of which is in circuit with a wire screen H, placed a few yards in front of the muzzle of the gun. A second rod E is suspended from an electromagnet in circuit with a second screen I at a given distance, say 50 yards beyond H. When the gun is fired the projectile traverses the first screen H, breaking the circuit and releasing the rod D. When the second screen is traversed the rod E is released, and when it strikes the trigger F a

knife is released, which makes a mark on rod D, thus indicating the distance fallen during the flight of the projectile between the two screens. A device, known as the "disjunctor" G, permits both circuits to be broken simultaneously, with a corresponding mark on rod D, which gives the distance fallen during the time taken by the rod E to strike the trigger F and for the knife to strike the rod D. The distance between the two marks being measured, the law of falling bodies enables the time of fall to be determined, and hence the time required by the projectile to traverse the distance from H to I; this

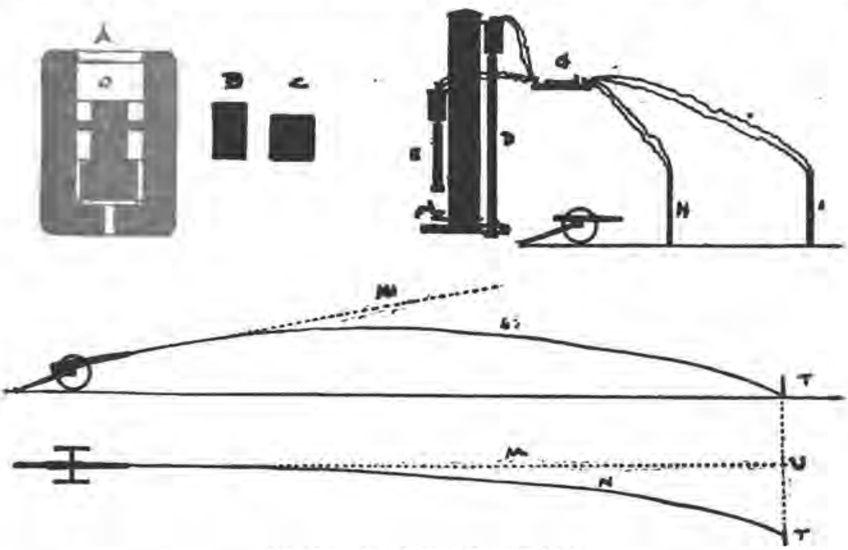


FIG. 49.—For description see text.

distance divided by the time gives the velocity of the projectile midway between the screens H and I.

Exterior Ballistics (figs. 49 and 50).—Were a projectile fired *in vacuo*, and were the force of gravity absent, the projectile would move indefinitely in a straight line K (fig. 49), according to its initial velocity. The resistance of the air, however, constantly reduces the velocity of the projectile and the force of gravity, in accordance with the law of falling bodies, constantly draws it away from its initial direction, with the result that the projectile describes a parabolic trajectory, striking the earth at the point T. As the projectile leaves the gun with a high velocity of rotation about its longitudinal axis, it is in fact a gyroscope, and its axis AB (fig. 50) tends to remain parallel to its initial direction and makes an angle with the trajectory CD. At the same time the phenomenon of precession causes the axis to rotate slowly, describing a cone about its initial direction. Nearly all guns are rifled with a right-hand twist, and the projectile therefore rotates, viewed from the rear, in the direction of the hands of

a watch, and the precession is in the same direction. In flight, therefore, the axis of the projectile is inclined upward and to the right of the trajectory, with a result that the resistance of the air acts on its under and left surface. This unbalanced pressure produces the phenomenon of *drift*, with the result that the projectile, instead of following the straight line M (fig. 49), curves to the right, striking the target T to the right of the point U. This drift is compensated for by the deflection slide of the sight.

The sketch at the bottom of figure 50 is intended to show one of the simple methods of striking an object M at an unknown distance from the gun. Suppose the range is estimated to be about 3,500

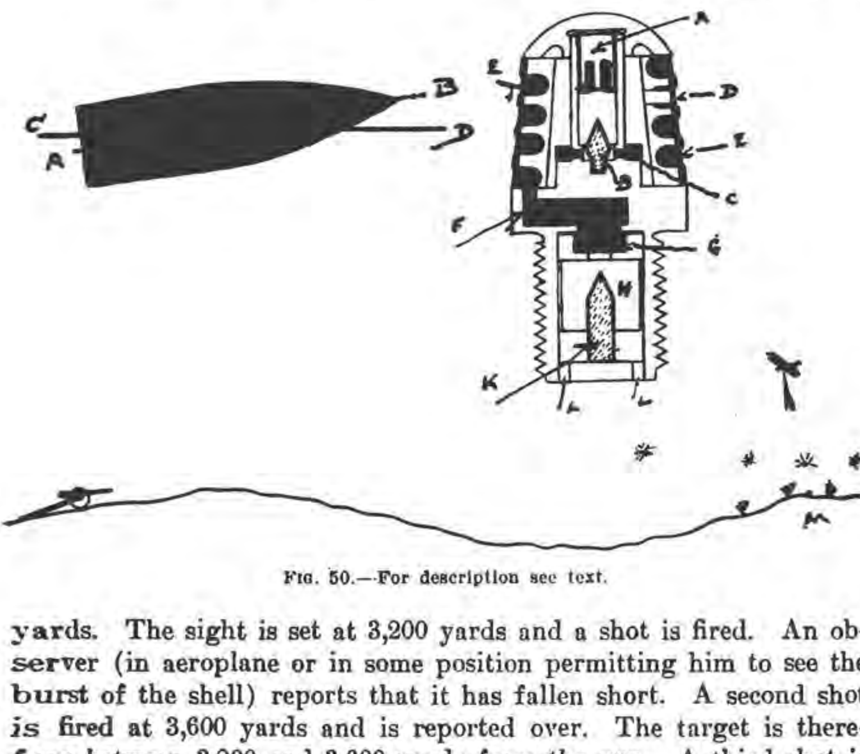


FIG. 50.—For description see text.

yards. The sight is set at 3,200 yards and a shot is fired. An observer (in aeroplane or in some position permitting him to see the burst of the shell) reports that it has fallen short. A second shot is fired at 3,600 yards and is reported over. The target is therefore between 3,200 and 3,600 yards from the gun. A third shot is fired with the sight at 3,400 yards and falls short; the range is now known to be within 3,400 and 3,600 yards, and so on until the observer reports the range is correct. With time fuses the distance may be determined by assuming the time of flight to the target, increasing or diminishing this as the burst of the shrapnel is short or over, dividing the difference between the assumed time for the third shot, and so on until the range is obtained. When the target is visible from the ground a range-finding instrument is used when practicable to control the fire.

COMBINED TIME AND PERCUSSION FUSE (fig. 50).—This type of fuse head is used almost exclusively with shrapnel, a simple percussion fuse being employed with the explosive shell. The fuse shown is similar to the service French shrapnel fuse, but differs in certain details. This fuse is screwed into the point of the shrapnel, and upon discharge of the gun, the plunger A drives down upon the pin B. The fulminating compound in the plunger detonates, igniting the ring of powder C. The gas evolved blows through the hole D, igniting the train of compressed powder E, which is wound in a spiral about the body of the fuse. The time train burns slowly until the flame reaches the magazine F, when the latter explodes, driving the flame through the channels LL into the body of the shrapnel and igniting its bursting charge. By means of a special tool the hole D may be pierced at any point of the length of the time train, thus

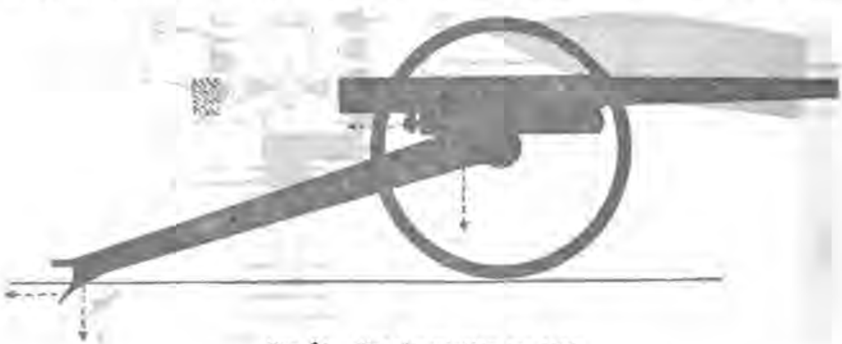


FIG. 51.—For description see text.

causing the shrapnel to explode within one-tenth of a second of any given interval of time. The percussion arrangement is lodged in the stem of the fuse, and upon discharge the lead plunger H rides down on the firing pin K exposing the point of the latter. Should the projectile strike a resisting object before the time train has caused its explosion the plunger will drive forward, strike, and detonate the primer G. This will ignite the magazine F, which will cause the explosion of the shrapnel.

The stability of the French field gun, "75," is shown in figure 51. The shaded square back of the breech is the point to which the barrel of the gun recoils after firing. The pointed spade at the end of the trail is forced into the ground after the first shot and, with the hydropneumatic brake system (shown under the barrel), takes up the entire recoil. In addition to this, there is a metal brake for the gun-carriage wheels with a spike on the under side. This brake is made to slide on the rim of the wheel, and when the gun is stationary the wheels rest on the brake and thus force the spike into the ground.

The use of the quick-firing fieldpiece has become of such paramount importance in the present war as to warrant a close scrutiny

of the projectiles in use by the opposing forces, and in this study the surgeon is especially interested, in that by far the greater number of serious wounds are inflicted by the different types of shell used in these guns (fig. 27).

It will be seen that there is very little difference in construction of the shrapnel shell and case in those employed by the various countries. The form of the propelling charge held in the brass case differs in almost every instance, but without exception smokeless powder in some form is used. In the American shell nitrocellulose smokeless powder is used in perforated cylindrical grains; in the Russian and British shell a crystalline form of smokeless powder is used; in the German case the smokeless powder is compressed into long sticks and arranged in bundles, while the French also use a smokeless powder compressed into thin strips (fig. 28).

A description of the French fuse head for common shrapnel has already been given, and it only remains to discuss briefly the working of a typical fuse in use by the other four powers, as shown in figure 29. As the projectile is driven down the bore of the gun the inertia of the concussion plunger causes it to slip through the resistance ring and strike the pin E, which explodes the percussion primer. The flame of the primer passes through A and ignites the fixed time train. To increase the length of the time train it is usually made in two parts, as shown, one of which is contained in a movable ring, and by turning this the time of burning is regulated. In the typical fuse the annular train burns from the point of ignition hole A until hole B in the movable train is reached. The movable train is then ignited through B and burns back to fixed hole C, communicating with magazine F. The greater the annular distance between hole B and hole A, the longer the fuse will burn before explosion. By setting the movable ring so that B is opposite A, flame is at once permitted to pass through B and C and the projectile is exploded within a few feet of the muzzle. A simple percussion or impact fuse is ordinarily combined with the time fuse. In the typical fuse sleeve I slips over J at the time of firing, exposing pin K. Upon striking, I and J move forward and pin K strikes primer L, which ignites magazine F by way of D and C and explodes the shrapnel. For percussion the fuse is left set as for transportation.

The range of the 3-inch type of shrapnel shell is about 6,500 yards, and the muzzle velocity of the quick-firing field gun ranges from 1,700 to 1,930 feet per second. The rapidity of fire ranges from 15 to 25 times a minute, and the average weight of the projectile is 18 pounds. The duration of flight ranges from 21 to 25 seconds, and when the bullets (about 350 per shell) are blown out of the shell by the bursting charge they are given an increased velocity of

from 250 to 300 feet per second. The velocity of the shrapnel at 6,500 yards is about 724 feet per second. In all cases the lead bullets are about one-half inch in diameter, weigh approximately 167 grains, and are kept from moving in the shell by a resin or other smoke-producing matrix. The matrix and bursting charge of black powder are also used as a tracer. It is important that the explosion of the shrapnel be plainly seen, so that observers can direct the accuracy of the gunfire. With shrapnel for field guns at long range, certain conditions of the atmosphere make it difficult to see when the shrapnel actually bursts, and various mixtures are used to overcome this difficulty. In some instances fine-grain black powder is forced in with the bullets. In German shrapnel a mixture of red amorphous phosphorus and fine-grain powder is used and produces a dense cloud of white smoke.

Shrapnel wounds are characterized usually by considerable contusion and destruction of deep tissue, as a result of the "mushrooming effect" of the soft unjacketed lead bullet, especially when compact bone is struck. They are always infected wounds, and it is not unusual to find pieces of clothing and distorted bullets in these wounds (figs. 30–33).

On account of the barbed-wire entanglements and other obstructions used in the present trench warfare, it has been found necessary by both sides to employ an increasingly large number of high-explosive shells, which are usually used in siege operations to clear the way in advance of assaulting troops. While they are used exclusively in the larger but stationary guns, they are also manufactured on a very large scale for the mobile light field pieces ("75," "77," and 3-inch). These shells are, as a rule, fused to burst on impact only. The firing pin of the detonating fuse is armed practically as described for the percussion firing pin of the combination fuse. Upon impact the firing pin strikes a primer which detonates a small quantity of fulminate of mercury or other detonant contained in the forward end of the fuse. This in turn detonates the high-explosive bursting charge and causes fragmentation of the thick shell. In figure 38, A is the metal part of the shell, B is the high explosive, C the detonating fuse, D the copper rotating band, and E a copper base cover. While used in light guns primarily to attack small field works and such objects as can be appreciably injured by a small charge of explosive, they give rise to an exceedingly destructive wound when the large fragments incidentally strike the soldier.

As already indicated, shell and shrapnel wounds are practically always infected, on account not only of the large gaping wound, but also on account of the pieces of clothing and dirt driven into the tissues by the missile (figs. 34–41).

The high-explosive shell, particularly that of the lighter field pieces, gives rise to small as well as large fragments, and there are usually multiple wounds from the same shell.

The necessity of carrying both high-explosive shell and shrapnel, and the impossibility of predicting the proper proportion, has led to attempts, on both sides, to develop a compromise projectile which would perform the function of both. This has resulted in the high-explosive shrapnel (fig. 39), a shell which as yet is in its infancy of development, but which bids fair to replace both the former types of projectiles. If it is desired to use the shell as shrapnel, the time fuse is set and, upon explosion in the air, the head and balls are driven out to the front. The head is larger than the common shrapnel, but the combination fuse is on the same principle. The construction of the rear portion of the projectile is the same as that of the common shrapnel except that the matrix surrounding the balls is a substance, such as trinitrotoluol, which will merely burn when ignited by black powder, but which will act as a high explosive if a detonating fuse is exploded in contact with it. When it is desired to secure the effect of a high-explosive shell the fuse is not set, and upon impact the head detonates as explained above.

Figure 39, in addition to illustrating the principles of the high-explosive shrapnel, shows the modifications made in one type to render it more effective against air craft. At B is a partial annular ring of inflammable material, resembling the time ring of a combination fuse. It is ignited by flame from passage A at the time the base charge is exploded. As the head, C, continues its flight, a trail of smoke is left by B, and after a certain time B burns around to D and ignites the detonator E, which latter detonates the head. A quantity of smoke-producing material at F is intended to increase the visibility of the burst. As the two explosions are separated by a considerable distance, the chance of fragments hitting an object in the air is increased, and the flame from B would explode a balloon under certain circumstances (fig. 43).

When the war began ammunition was being issued to the "75" in the proportion of one-half shrapnel and one-half high-explosive shell. Recently, at the unanimous request of French artillery officers, the manufacture of shrapnel was discontinued. There is plenty of evidence to show that the French shrapnel was highly effective, but the artillery officers considered the high-explosive shell much better, both on account of effectively sweeping a larger area and on account of the fact that in the vicinity of the explosion air vibration alone is sufficient to cause instant death. This fact has been proven by the examination of a great number of bodies, found on the scene of the explosion of these shells, dead without the slightest indication of a

wound. French officers have stated that they have seen German soldiers hurled 10 meters into the air by the explosions of these shells. The "75" high-explosive shell explodes almost immediately upon leaving the ground, there being just enough delayed action in the fuse to cause it to explode between 5 and 7 feet above the ground.

The death from these shells, without any apparent wounds, has remained a mystery. An officer at the front sent to M. Arnoux, a French engineer, a pocket aneroid barometer which had been damaged by the explosion of a big shell three yards away from it. M. Arnoux found that one of the levers by which the oscillations of the mercury were transmitted to the pointer had been forced under the other instead of remaining on the same plane. He replaced the levers in position and put the barometer in an air-tight vessel from which latter he pumped out the air. When the pressure had thus been reduced from 760 to 410 millimeters (the figure recorded on the top of Mont Blanc at an altitude of 15,782 feet) the levers assumed the position in which he found them. It was thus shown that the explosion had caused a sudden atmospheric depression to the extent of about 350 millimeters of the mercury tube, corresponding to a dynamic pressure of about 10 tons to the square yard. The men exposed to this violent change met with conditions similar to workmen who leave compressed-air chambers without taking the proper precautions, the effect being to liberate nitrogen suspended in the blood and to transform it into bubbles of gas. These bubbles are driven by the action of the heart into the capillary vessels, stopping the circulation of the blood in the vital centers and causing instant death. But it would appear that this explanation does not take into consideration the primary air compression by which men, as stated above, are sometimes hurled into the air as a result of the explosion *per se*. Therefore it may not seem unreasonable to assume that these deaths without apparent wounds may be due to the blow the body receives from the primary violent air impact, delivered as a blow over one side of the body and especially over heart and readily compressed abdomen, thus causing reflex actions that register themselves with fatal effect.

The "75" high-explosive shell is as follows:

Weight of projectile.........pounds..	11.7
Weight of bursting charge.........ounces..	29.0
Weight of propelling charge.........do....	22.5
Initial velocity (feet per second).........	1,920

Comparing the bursting charge contained in the French shell (29 ounces) with the bursting charge of the German shell ("77"), which is only 5.5 ounces, the comparison seems ridiculous, but this difference is explained by the fact that the Germans are developing a high-explosive shrapnel, to replace both their present shell and shrapnel,

which contains a considerable amount of high explosive incorporated in the matrix of the shell.

The subject of light field artillery can not be dismissed without referring to the marked enthusiasm and confidence that both French officers and men exhibit in the "75" (fig. 46). The unbounded faith they seem to have in this weapon is truly remarkable. Whether this is born of a goodly share of inherent patriotism or whether it represents an expression of the real merits of the gun only time and history will show. The fact remains, however, that with such implicit confidence in the superiority of their "75" over all others, it would seem to be a considerable factor in promoting and sustaining an excellent morale among all classes of French soldiers. This factor alone is of great value, regardless of any proved superiority of the gun. Not until statistics on both sides have been compiled and edited can a trustworthy opinion be formed.

ASPHYXIATING GAS.

Chlorin or bromin gas, compressed to liquid form and liberated from large metal tanks when the wind is blowing toward an opposing trench, has caused very distressing deaths when inhaled in concentrated form. Being heavy gases, they hug the ground, moving to leeward, and sink into the trenches. The first effect is to cause the eyes to water, and this is quickly followed by a violent irritation of the bronchial tract. If troops are unprotected, and remain in the trenches, they rapidly develop a capillary bronchitis, with a hypersecretion of thin watery mucus, which fills up the air spaces of the lungs and practically causes death from drowning. Those receiving concentrated doses have died in from one to three hours, sometimes from edema of the glottis, but principally from exhaustion of the heart in trying to pump the blood through the engorged capillaries surrounding the bronchioles and ultimate air spaces of the lungs. This suffocating process sometimes lasts from one to three days, the younger men with stronger hearts holding out longer than the older.

The mortality from this form of suffocation depends on the degree of concentration of the gas inhaled and the age of the patient. Many cases have been mild on account of the capricious action of the wind in distributing the gas along the trenches, some parts of the line receiving it in more concentrated form than others. This results in all stages of an asphyxiating bronchitis, from the grave cases which are cyanosed and gasping for breath to those suffering from a mild form of irritation of the bronchioles. On this account some recover quickly and others, lingering for a longer period, slowly regain the normal, not infrequently exhibiting more or less marked evidence of bronchiectasis. The postmortem examinations of the lungs show them to be about four

times their normal weight, with an enormous dilatation of the air spaces, which latter are filled with a thin, watery, and sometimes blood-streaked mucus.

As regards treatment, those in the open air seem to suffer less. Oxygen gas, administered slowly, unquestionably gives relief. Atropin, hypodermatically, is used for the overdistended right heart, while the lateral-prone position of the patient favors drainage of the lung fluid.

By far the most important treatment is, of course, the prophylactic use of some form of combined helmet and respirator, which is intended not only to render the gas innocuous, but also to protect the eyes. When the gas was first used it came as a surprise, and there were many more victims than at present. There are a number of different types of protecting masks in use, all having for their object the neutralization of the gas when inhaled through the mask or helmet. Experience has taught that to be effective the protecting apparatus must either be in the form of a helmet entirely covering the head and tucked in at the neck, or in the form of a mask fitted snugly around the face under the chin and over the front part of the cap above the visor, by means of strong elastic and tape (fig. 47). The mask or helmet should be made of some impermeable material, such as mackintosh, with a piece of transparent celluloid, about 8 inches long by 3 inches wide, sewn into a corresponding elongated oval opening cut in the mask opposite the eyes. That part of the mask in front of the nose and mouth is punctured by about 25 small round openings arranged in the form of a square. Behind these openings, inside the mask, a slightly larger square piece of cloth, also punctured with holes, is sewn so as to form a pocket for a little pad, impregnated with chemicals, which is slipped into the pocket just before the mask is to be used.

The pad in this form of protector is about 4 inches long by 3 inches wide and contains an equal quantity of hyposulphite and bicarbonate of sodium distributed equally throughout the pad by a few loose stitches holding the sides of the pad together. When the protector is to be used, about 1 ounce of water is poured on the pad from a small bottle, the latter kept in the soldier's coat pocket for that purpose, and the pad is then slipped into the pocket of the mask just before the latter is adjusted.

The first forms of masks consisted simply of gauze or oakum saturated with the chemicals and secured around the mouth and nose. This did not protect the eyes, which quickly became irritated, so that it was impossible to keep them open for long when the gas was concentrated. This, of course, prevented the soldier from fighting in the presence of gas. It was also thought that it complicated matters by having the chemicals in solution beforehand, whereas in the form

of mask described above it was only necessary to pour water on the pad before using. Several of these pads are furnished with each mask, to be kept in a tin box in the pocket along with the small vial of water. The mask form of protector is thought to be much more practicable, in that it is not as disagreeably hot as the helmet form and can easily be secured above the visor when not in use, thereby making it more easily accessible at all times. Masks containing a pad saturated with limewater or turpentine have also been used.

Not infrequently the gas may be seen for some distance as a thin greenish-yellow cloud, and it is ofttimes possible to detect the odor for an appreciable time before it becomes concentrated, thereby giving sufficient warning to allow the masks to be adjusted in time to meet the oncoming gas.

Flame projectors (*flamenwerfer*) are used by the Germans for throwing burning liquid. They are very much like the ordinary portable fire extinguisher in construction, throwing a liquid which at once catches fire spontaneously and has an effective range of 30 meters. The burns caused by this method are of the deep, sloughing variety, exposing tendons and bones, and are treated with wet dressings until healthy granulations appear. These flame projectors are mainly employed in street and house-to-house fighting, although their use in the trenches has been reported a number of times.

Hand grenades (bombs) and shells have recently been employed at short range to produce an irritating and asphyxiating gas on bursting. Although intended to render portions of the trenches untenable, reports from the front indicate that their action is very variable and much influenced by the presence of wind. The necessarily small quantity of gas that is evolved at the time of bursting has a very restricted local effect.

CLASSIFICATION OF MENTAL DISEASES.[1]

By R. Sheehan, Passed Assistant Surgeon, United States Navy.

It is interesting to note that disorders of the mind are being considered from a broader point of view and it is necessary to correlate the later conception of the insanities, as regards their classification, with our former ideas regarding this subject. Classification in mental diseases has always been difficult and consequently confused. This has been due to the fact that hitherto our knowledge of these conditions has been very circumscribed and rather indefinite. Our insight into the mental processes with a normal nervous system is still so vague that any attempt to consider the mechanisms of an abnormal mentality has, of course, not been very successful. Here the problem of classification is very different than with general diseases, and even

[1] Lecture course, Naval Medical School.

with these we are far from perfection. As stated lately by Medical Director Gatewood, United States Navy, "We can do nothing without nomenclature and classification." There must be a fixed point of departure, or known quantity to enable us to make statistics and show relations of various entities, also to provide some common basis permitting the exchange and correlation of experiences, thus increasing the general fund of knowledge.

In even the simplest mental disorders we have to deal with many indeterminate and poorly defined factors, and our knowledge of these is limited, in fact may still be said to be in its incipiency. In typhoid fever or nephritis we recognize a more or less definite morbid process, whereas aside from general paresis, and the recent work by Southard in dementia precox knowledge of the pathology of the alienations is practically *nil*. In the endeavor to acquire a working basis comparable with that in internal medicine, there have been numerous attempts at classification, none of which have proven satisfactory, and as Kirchoff has said in his Hand Book of Psychiatry, "My own classification undoubtedly possesses many defects. It merely attempts to furnish a rapid survey of the essentially different clinical forms of insanity, etc. Hence it can only be regarded as a temporary makeshift." Nearly every author has advanced his own classification. These have included some of only three or four groups and others containing as many as 60. In these latter the effort has resulted in such complexity as to no doubt account in great measure for the pessimistic attitude of the general profession toward the study of psychiatry.

In the scientific journals it is not unusual to find the statement that a certain case does not fit into any division of our present-day classification. It is recognized that to describe a case as an atypical example of a disease is equivalent to stating that some factor has escaped our notice, or is one we can not explain. Our etiology from a psychogenic as well as a pathogenic point of view must be considered and the bodily and nervous symptoms may be as much a part of the disorder as are the psychic; in fact, these last are often merely a symbol expressing some change in the function of an organ aside from the brain.

In the matter of classification, it can be truly stated that any attempt to group mental disorders under separate heads can be only tentative, because, as White has remarked, "It is impossible to pigeonhole mental diseases as there are no clear-cut demarcations between cases." The important thing is an understanding of the patient, not merely a labeling of the psychosis. We are beginning to learn that disease types are not the absolutely definite things they were formerly supposed to be, and that especially in mental diseases each and every case can not be placed under one caption for all time. This is true

because a diagnosis which is accurate to-day may be far from descriptive of the condition a few months from now. Also we must consider that in any of the chronic psychoses acute symptoms may develop entirely distinct from the fundamental disease, just as a typhoid patient may develop tuberculosis, again we must not forget that in a given case two different psychoses may be coincident, thus baffling its location under any one heading. Also there is a fact that there are transitional cases in which the picture varies as they progress.

In the past the matter has been approached from many viewpoints, such as the psychological, the pathological, the physiological, the etiological, and the clinical. Realizing the inadequacy, and the impossibility of adhering to any one of those, most writers have adopted combinations of several as a basis of classification. However, there are types that defy location even by this method.

In dealing with psychic phenomena and the necessary study of the functions of the cerebral cortex, we must take advantage of all viewpoints and not content ourselves with a superficial and unsatisfactory psychology, thus allowing the tendency to substitute theory and speculation, which is easier for the comparative certainty allowed by observation and experiment. Even now with all the advances which have been made recently little is known and much remains to be ascertained. Still it seems that as we acquire more precise methods of investigation we shall more rapidly approach an understanding of this subject. This will enable us to adopt a fairly exact classification upon an anatomo-pathologic basis, which will satisfactorily describe psychiatric conditions. At present while we must confess that the relationships are fairly apparent in the simpler normal sensations this can not be said of the more complicated and especially of the abnormal psychic phenomena.

It is hardly necessary for our purpose to take up in detail these different bases of classification except to state, for example, that as regards the psychological basis alone it is readily seen that this would be as undesirable as would be an attempt to limit clinical medicine to a study of symptoms without considering any of the underlying factors. The alienist fully appreciates that his line of investigation differs essentially from that of the psychologist, although realizing that they have much in common.

We must comprehend that the anomalies in thought, action, volition, and emotion, popularly referred to as forms of insanity, are the expressions of a disordered functioning of the central nervous system. We must realize that the same biological methods of investigation that are available in the rest of medicine are applicable to the problems of mental disease.

Insanity can hardly be termed a disease. It is rather a class of disorders which tend to arrange themselves with greater or less

exactness into groups of reaction types. It might be well to add here that we may expect exact analysis of these types only when we consider them in conjunction with the study of the mental make-up of the individual before he becomes insane.

To take up just one other of the so-called bases, say the etiological, we can see how unsatisfactory it is if we consider as the causative factor alcohol. There are a number of mental disturbances induced by alcohol, and of these so-called alcoholic psychoses one patient will develop delirium tremens, another acute hallucinosis, a third a Korsakow's psychosis. Why it should occasion the special form of psychosis in each case we do not entirely understand. Besides, some patients as a result of alcohol develop entirely different conditions. It may precipitate an attack of manic-depressive insanity, dementia precox, or general paresis.

Without burdening you with any further consideration of these abortive attempts, I wish to call to your minds as briefly as possible the veritable maze which confronted you as you perused one of the older classifications, say that of E. Mendel, professor in the University of Berlin. This was published about 1902, and it was a fair example of the prevailing ideas and as revised by W. C. Krauss in 1907 was quite acceptable. It considered:

I. Idiotism.
  1. Imbecility.
  2. Idiocy.
II. Functional Psychoses.
  1. Delirium hallucinatorium.
    (a) Active hallucinatorium.
    (b) Passive hallucinatorium.
    (c) Mixed form hallucinatorium.
  2. Mania.
    Typical mania.
    Hypomania.
    Recurrent mania.
    Mania gravis.
    Periodical mania.
  3. Melancholia.
    (a) Simple melancholia.
    (b) Typical melancholia.
      1. Hypochondric melancholia.
      2. Moral melancholia.
      3. General melancholia.
  4. Circular psychosis.
  5. Paranoia.
    (a) Rudimentary paranoia.
    (b) Typical paranoia.
      1. Acute simple paranoia.
      2. Chronic simple paranoia.
      3. Acute hallucinatory paranoia.
      4. Chronic hallucinatory paranoia.

II. Functional Psychoses—Continued.
Varieties.
1. Hypochondric paranoia.
2. Primitive paranoia.
3. Paranoid melancholia.
4. Paranoid dementia.
5. Katatonic paranoia.
6. Periodical paranoia.
6. Acute dementia.

III. The Psychoses Arising from Central Neuroses.
1. The epileptic psychoses.
(a) Pre-epileptic insanity.
(b) Post-epileptic insanity.
(c) Epileptic equivalents.
(d) Chronic epileptic psychoses.
2. The hysteric psychoses.
3. The choreic psychoses.

IV. The Psychoses of Intoxication.
1. Auto-intoxication psychoses.
Endogenous psychoses.
2. Exogenous psychoses.
(a) Infectious diseases. Korsakoffs' (?).
(b) Ergotism.
(c) Pellagra.
3. Psychoses which are evoked by organic poisons.
(a) Alcoholic psychoses.
1. Acute alcoholic psychoses.
2. Subacute alcoholic psychoses.
(a) Abortive.
Delirium tremens.
(b) Chronic.
(c) Febrile.
(d) Polyneuritic.
3. Alcoholic melancholia.
4. Alcoholic hallucinatory paranoia.
(a) Chronic alcoholic psychoses.
(b) Morphinism.
(c) Cocainism.
(d) Psychoses due to inorganic poisons $\left\{\begin{array}{l}\text{CO.}\\ \text{Pb.}\\ \text{Hg.}\end{array}\right.$

V. The Organic Psychoses.
1. Diffuse diseases of the brain cortex.
(a) Progressive paralysis of the insane.
1. The demented form.
2. The classic or typical form.
3. Agitated form.
4. Depressive form.
5. Circular form.
6. Ascending form.
(b) Senile dementia.
(c) Arteriosclerotic psychoses.
(d) Syphilitic psychoses.
2. Psychoses due to focal brain disease.
(a) Post apoplectic.
(b) Brain tumors.

Now to compare with this our more recent ideas, say according to White, which classification is simple and seems most desirable.

1. Paranoia and paranoid states.
2. Manic-depressive psychosis.
3. Paresis.
4. Dementia precox.
5. Involutional melancholia.
6. Senile psychosis.
7. Infection with exhaustion psychosis.
8. Toxic psychoses.
9. Psychoses connected with other diseases.
10. Borderland and episodic states.
11. Idiocy and imbecility.

This improvement was due in great measure to the work of Kraepelin, following the idea of Falret, who as early as 1851 described a periodic mental disturbance which he designated as "*folio circulaire*" and affirmed that the so-called circular insanity was a disease entity. It became evident that hitherto sufficient care had not been exercised in estimating the relative importance of all factors pertaining to the etiology, symptomatology, course, prognosis, and termination of these periods of mental aberration. Moreover, clinical experiences had demonstrated that the only logical and scientific method of studying diseases was from this broader and far more comprehensive standpoint. As a result of these changes of view, less stress was laid upon individual and isolated symptoms and an attempt was made to give each event of the disease its just valuation. However, as soon as the truth of these underlying principles had been recognized it was found that many cases of the so-called simple mania or melancholia, as well as the mixed forms, have many features in common. On closer investigation it also became apparent that pure cases of mania or melancholia never occur. Kraepelin, imbued with these ideas, grouped together under one head these diseases having a common symptomatology, with a certain more or less well-marked tendency to recur and a similar outcome.

One of the fundamental facts which served to direct investigations along this line was that in many forms of alienation a group of symptoms are in the foreground of the clinical picture which formerly had been considered specifically characteristic of the circular insanities. The presence of a marked degree of mental deterioration in some cases and its absence in others was also an important consideration that influenced the genesis of the views entertained by the Heidelberg school in the formation of the conception of manic-depressive insanity.

Dementia precox, including all cases in which there is a characteristic mental reduction, affords a strong contract to those in which the symptoms of excitement or depression, with a tendency to recurrent attacks, may occur, but without development of any well-marked deterioration of the mental faculties during the lucid intervals, or as a terminal dementia. Still, at that, it is possible that dementia precox is not a disease entity. This group of symptom-complexes is formed by the union of several clinical types of alienation that hitherto have been considered distinct. Adolph Meyer considers Kraepelin's cre-

ation of dementia precox the great psychiatric advance of recent years. It is time to think of creating disease entities among mental maladies, with due utilization of cause, course, and outcome. In the older textbooks there is no truly helpful or convincing description of the factors which determine an unfavorable course in mental disorders. "Instead of the usual hazy statements, Kraepelin has pointed out features which are common to a great number of the so-called terminal dements. He has found them to exist from the very beginning in a very large number of all cases that ultimately deteriorate. The emphasis of these features, somewhat at the expense of the temporary pictures which so far received the main attention, was a real stroke of genius." His bold picture allows of a correct estimate of a very large number of cases which formerly figured as doubtful with regard both to classification and outcome. Every alienist knows that he meets cases in which from the beginning the prognosis is poor, and to a very large extent these cases are the ones stamped by the signs of Kraepelin's deterioration process.

Since the dementia precox group was first formulated it has received much criticism, and this has led the author to make some changes in his views, as shown by his latest edition. In his latest definition he adheres to the idea of deterioration, but now proposes to further divide the group by separation of types which show differences in their outcome—such as the addition of paraphrenia, which is a purely tentative effort to deal with some of the difficult paranoid cases, the criterion being the final outcome. Instead of the disorganization of the psychic personality affecting chiefly the affective life and will, here there is less disturbance of the inner character of the mental life, the main disturbance being with the intellectual functions. This step is no doubt a good one and coincides with the belief that the termination is the best criterion of the disease process, and in it we still see that classification is still in a state of fluidity which varies as we acquire more information.

The ready appreciation of these ideas has done much to simplify classification and by thus clarifying the subject matter will no doubt stimulate interest in the study of mental diseases.

REFERENCES.

Kirchoff. "Hand Book of Psychiatry." (1893.)

Gatewood, J. D., Medical Director, U. S. Navy. "The Medical Man and Vital Statistics." U. S. Naval Medical Bulletin. Jan., 1912.

Southard, E. E. "A Study of the Dementia Precox Group, etc." Amer. Journal of Insanity. July, 1910.

Mendel, E. "A Psychological Study of Insanity."

Mendel-Krauss. "Textbook of Psychiatry." 1907.

Tuke. "Dictionary Psychological Medicine."

Kraepelin. "Lehrbuch des Psychiatrie."

White. "Outlines of Psychiatry."

Singer. "Dementia Precox in the 8th Edit. of Kraepelin's Textbook." Jour. Ment. & Nervous Diseases, Jan., 1915.

SECOND REPORT ON THE SCHIER TEST FOR MENTALITY, WITH SPECIAL REFERENCE TO THE POINT SYSTEM.

By G. E. THOMAS, Passed Assistant Surgeon, United States Navy.

Since my last report[1], data covering the mental examination of 300 prisoners has accumulated. The results obtained in these examinations have been tabulated; first, according to the old system of marking; second, according to the point method suggested by Dr. Schier in his article which appeared in the Naval Medical Bulletin for April, 1915; and third, with the view of comparing those found mentally deficient by either or both systems.

According to the old system of marking, 70 per cent was taken as the passing mark, and of 300 examined, 29.6 per cent failed. This result corresponds with my last report, in which 28 per cent of 100 prisoners examined failed to pass the 70 per cent minimum.

By the new point system in which a mark less than 50 per cent is considered indicative of definite mental deficiency, 19.5 per cent of the 300 cases failed.

TABLE 1.—*Three hundred cases examined by Schier system.*

Old system.		Point system.	
Per cent.	Number passed.	Class.	Number passed.
100	19	A, 75-100	67
90	71	B, 60-75	102
80	61	C, 50-60	73
70	60	D, below 50	58
60	37		
50	29		
40	11		
30	10		
20	2		
Total	300	Total	300
Failures (below 70 per cent)..per cent	29.6	Failures (class D)..........per cent	19.5

If class C, which is regarded as average to doubtful, is included among failures 44 per cent would have failed.

TABLE 2.

Point system.		Old system.
Class.	Number passed.	
A	67	All passed 80 or above.
B	102	All passed 70 or above, except 1—50, 1—60.
C	73	36 passed 70 per cent; 61.6 per cent would have passed 70 per cent; 9 passed 80 per cent; 28 below 70 per cent; 38.4 per cent would have failed.
D	58	3 passed 70 per cent; 55 below 70 per cent.

Judging the point system by the old system, 61.6 per cent of class C would have passed 70 per cent and nearly all of class D would have failed.

[1] Thomas, G. E. The Value of the Mental Test and its Relation to the Service. U. S. Naval Medical Bulletin, ix, No. 2.

We can safely consider those placed in class A or class B to be above the minimum grade in the old system and those placed in class D to be below the 70 per cent grade. Just what value to give class C is the question, as 61.6 per cent would have passed and 38.4 per cent would have failed, according to the old Schier.

The relative value of class C and the 70 per cent minimum of the old system is best obtained by a comparison of 12 marines now doing duty and who have been carefully marked according to their efficiency.

TABLE 3.—*Twelve marines who failed to pass 70 per cent Schier.*

No.	Rate.	Service.	Efficiency.	Old system.	New system.	Time.
		Years.				
1	Corporal	9	4.5	60	44	20
2	Private	8	3	50	44	10
3	.....do	2	3.5	50	51	23
4	.....do	3	3	50	38	15
5	.....do	6	3	60	61	16
6	.....do	3	2	60	50	10
7	.....do	3	3	60	54	11
8	.....do	8	2.5	60	48	14
9	.....do	4	3.5	60	44	21
10	.....do	2	3	60	56	15
11	.....do	6	2	30	16	18
12	Sergeant	3	....	60	56	13

All are classed in C and D excepting one.

Only 1 of the 12 is believed to be of the average in efficiency and a good soldier; the other 11 are considered by their officers inefficient. This comparison would lead us to believe that class C is closer to the D type than to the B type.

TABLE 4.—*Twenty-eight prisoners who failed to pass 70 per cent Schier.*

No.	Offense.	Conduct.	Education.	Schier. Old.	Schier. New.	Time.
			Years.			
1	Conduct prejudicial to good order and discipline	First	4	30	......	25
2	Theft	...do	5	50	36	....
3	.....do	...do	2	60	......	22
4	.....do	Second	4	50	49	12
5	Scandalous conduct, resisting arrest	First	4	30	......	....
6	Desertion, 2 specifications	Second	8	60	......	20
7	Scandalous conduct	First	2	50	33	....
8	Sodomy	...do	5	30	......	11
9	Fraud	Second	5	30	......	10
10	Theft	First	6	50	39	9
11	Scandalous conduct; assault and striking another person in service	...do	5	30	......	21
12	Desertion	...do	5	60	......	23
13	Desertion and fraud: 2 specifications	Second	1	40	45	....
14	Desertion and fraud	...do	2	40	45	14
15	Theft	Fourth	6	60	......	24
16	Desertion	First	8	50	60	13
17	.....do	...do	8	60	59	7
18	.....do	...do	1	60	49	9
19	Desertion and fraud	...do	6	50	46	8
20	Assault and desertion	Second	8	50	52	11
21	Desertion	...do	8	40	39	15
22	Theft	First	10	50	58	8
23	Desertion	...do	5	60	67	10
24	Fraud	...do	5	60	......	11
25	Theft and opening mail	...do	6	40	46	15
26	Fraud and desertion	...do	8	60	60	9
27	Refusing to obey orders	...do	5	20	......	25
28	Scandalous conduct	...do	9	60	49	24

Of the 28 prisoners who failed, all are in class C or class D excepting two in class B. This would further strengthen our belief that class C harbors some mental defectives of the serious type.

It is apparent that if a mental test is to be of any value a definite line must be drawn between the mentally desirable and undesirable, and although no test as yet designed can exactly fulfill this requirement it is believed that a line can be established that will exclude the greatest number of defectives and a minimum of normals. If by such an arbitrary standard we occasionally exclude material that will prove efficient and desirable but by this same standard we exclude the great majority of defectives this weakness is excusable.

In the point system a wide margin of doubt is established by class C, which for service purposes neither accepts nor rejects, and it is this very uncertainty that should be limited if a standard for recruiting is to be established.

I am strongly of the belief, based on the results of 500 examinations by the Schier system, that a 70 per cent minimum passing average is not too much to demand of the recruit. There is no doubt that a very small percentage—I do not think more than 3 per cent—of men who would be efficient and valuable to the service would be excluded by this arbitrary standard, but this sacrifice is small indeed when we exclude, which I believe we do, the great majority of the inefficient.

THE TREATMENT OF FRACTURED MANDIBLES.

By F. L. Morey, Acting Assistant Dental Surgeon, United States Navy.

Fractures of the jaws are of quite common occurrence in the service and are generally the result of blows upon the face from the fist either received in fighting or boxing; occasionally a fracture occurs coaling ship.

The inferior maxilla, from its shape, location, and size, is more often fractured than any other bone of the face, there being a comparatively small amount of flesh on this bone which would act as a cushion and lessen the liability of fracture. Its shape makes it liable to fracture through the symphysis or through the socket of the cuspid tooth, as the root of this tooth is so long it materially weakens the jaw at this point when a blow is received upon the side of the face, and through the ramus or neck of the condyle when the blow is received upon the chin.

Rarely is a jaw fractured in the extraction of teeth; occasionally a small portion of the process is fractured in the extraction of multi-rooted teeth whose roots widely diverge.

A great majority of fractures of the mandible are compounded generally into the mouth; multiple fractures are subject to the great-

est amount of displacement. Fractures occurring upon both sides of the mouth at the same time always present a great amount of displacement; the anterior fragment is always displaced downward and backward; the posterior fragments are drawn slightly inward, making the cavity of the mouth smaller.

The majority of fractures of the body of the bone are oblique, except those occurring at the symphysis, which are always vertical; the bone is also divided obliquely as to its width, the fracture generally occurs at the expense of the inner plate of the anterior fragment and of the outer plate of the posterior fragment. The line of fracture through the alveolar process is always vertical, following the direction of the roots of the teeth which would be only very slightly oblique in the region of the molars.

Saliva is always secreted in excessive quantities and, when mixed with the discharges from the lacerated tissues, decomposes and causes a fetid odor of the breath.

Various methods and appliances have been introduced for the purpose of holding the fractured portions of the jaw in apposition and immovable, from the simple four-tailed bandage to the most elaborate interdental splint. The vulcanite splint in some form or other has been the standard splint with the majority of practitioners in the past.

I am not very enthusiastic about the vulcanite-splint method, as it consumes valuable time, and it is very painful to adjust the parts temporarily in order to take a plaster impression. A plaster model is then made, over which the splint is formed. In this operation the frail toothlike edges of the fractured parts are rubbed together, breaking off the little spicules of bone and making the parts more difficult to bring into perfect apposition on account of the smoothness of the bones and the small granules that have broken off. These little granules will produce more or less irritation with subsequent inflammation. The splint will take about one day to complete, and the patient, of course, must wait until it is completed before final adjustment of the parts. The jaw becomes more inflamed before it is finally at rest in the splint, and the heat and moisture of the mouth, combined with the exudate from the lacerated tissue and particles of food working in between the splint and the teeth, in five or six weeks produce a condition that is anything but pleasant, to say the least. Ofttimes when this splint is removed, it is found that there is a slight malocclusion.

By using Angle's fracture bands and orthodontia appliances in the six cases of fractured jaws which I have treated since reporting for duty at this station, there have been much better results obtained, with less pain and quicker adjustments of the parts. Of course there are cases where the fracture bands will not do, e. g., a fracture

through the neck of the condyle and edentulous jaws, but of the latter we have very few in the service. The bands are kept on hand and can be applied, the fractured parts placed in apposition, the teeth placed in their normal occlusion, and the patient dismissed in less than two hours in the majority of cases. One is almost certain of normal occlusion and articulation, and the patient will have full use of his jaws in a few days after removing the appliances; tincture of iodin is applied every second day, and, by the use of washes, the mouth can be kept in a cleanly condition. A Barton bandage is applied for the first two or three weeks to relieve the strain of the wires on the teeth. The patients had very little pain with this appliance, and after a few days the inflammation subsided; they also have little trouble in eating soft and liquid food, and after a few days seem not to mind the appliances.

The following is a résumé of the cases that I have treated, with a short history of each:

Case No. 1. P—. Coal passer. December 2, 1914, compound fracture of the mandible through the socket of the left cuspid tooth. The patient had a full set of teeth. The length of the root of this tooth made this the weakest point of the jaw. Cause of the fracture, a blow on the left side of the face, received in a fight; had not the tooth been knocked from the mouth and lost I would have attempted to replant it. Displacement slight, the anterior portion being drawn slightly downward; the line of fracture was almost vertical.

I used Angle's "D" bands for the molars and Angle's threaded arch bar; removed the nuts from the arch bar, and placed the arch bar through the tubes on the "D" bands, then replaced the nuts, reversed on the arch bar. After removing the small granules of bone and process which had been broken off the frail edges of the tooth socket, I placed the "D" bands on the first molars, fastening them securely; then brought the parts in apposition and screwing up the nuts drew the ends of fractured bone firmly together. I then ligated the other teeth to the arch bar with Angle's ligature wire. The jaws were then placed in occlusion, and held in this position with a Barton bandage for two weeks, the bandage being changed every second day and the gums painted with iodin. The wire and the bands were kept on the teeth until December 31, 1914, the patient being instructed to use care in chewing or biting hard substances; after removal of the appliances the patient had good use of his jaws and normal occlusion.

Case No. 2. N—. Fireman second class. December 29, 1914, compound fracture of the mandible at the left side, between the second and third molar. Cause, fighting.

Placed Angle's fracture bands on the second molars on the left side and on the first bicuspids on the right side, superior and inferior. Brought the fractured parts in apposition, and the teeth in occlusion;

wired both jaws in occlusion by figure-of-eight wire around the lugs on the bands; also applied a Barton bandage to relieve the strain on the teeth.

Inflammation subsided in a few days, and very little pain or inconvenience was experienced from the appliance.

Painted the gums and changed the bandage every second day. Bandage removed in 21 days, and the wires in 33 days. Patient able to eat soft food; occlusion and articulation good.

Case No. 3. L—. Machinist's mate, first class. January 23, 1915. History of syphilis. Simple fracture of the mandible on the left side; between the second bicuspid and the second molar, the first molar having been extracted previously, which weakened the jaw at this point. Very slight displacement, and very little pain caused; the patient did not realize that the jaw was broken until the second day after the accident. Line of fracture was downward and backward, terminating at the groove for the facial artery.

Placed Angle's fracture bands on the left first bicuspids and on the second molars. Used a Barton bandage for 12 days to relieve the strain on the teeth. Removed the wires and appliances March 3, 1915; jaw very weak on that side; no doubt the delayed union was due to patient having had syphilis. Patient dismissed March 18, articulation normal and use of jaws normal.

Case No. 4. E—. Baker, second class. History of syphilis. January 9, 1915. Double compound fracture of the mandible; cause, fighting.

Patient received 10 days after the fracture occurred; mouth in extremely foul condition; pus oozing from the lacerated tissue at the site of both fractures, and tissues much inflamed. Patient had had no treatment since the fracture, except a loosely applied Barton bandage. The frail edges of the bones were worn smooth by rubbing together, which made it very difficult to procure perfect adaptation of the parts.

Lower right second molar missing, fracture occurring at this point; the lower left second bicuspid and the first molar missing, fracture on this side occurring at this weakened point. Tissues swollen and very sore; loss of sensation in the lower lip and on the chin.

Placed Angle's fracture bands on the right inferior first molar and right superior second molar, and left inferior second molar and superior first molar. Placed the parts in as nearly normal position as possible, as the patient had a bad case of malocclusion Class 111, and the inferior incisors locked labially to the superior incisors. By wiring the bands together I held the jaws in occlusion; also wired the opposing teeth together to hold the parts more firmly in

position. Applied the Barton bandage to aid in holding the jaws more firmly and relieve the tension on the teeth.

After the jaws were wired in position there was a roentgenogram taken which showed that the jaws were in almost perfect occlusion, which was very remarkable considering the degree of fracture and the length of time intervening between the fracture and treatment.

Removed the bandage, February 16, 1915, and the wires and appliances March 3, 1915. Jaws very weak; patient unable to use the jaws for about 10 days; but they gradually grew stronger and when he was dismissed he had good use of them.

Case No. 5. H—. Yoeman, third class. May 8, 1915. Compound fracture of the mandible, between the first and second bicuspid, left side. Cause, fighting. Line of fracture, almost vertical.

Placed fracture bands on the first molars on each side and wires on the left bicuspids; placed the jaws in occlusion and wired bands in place; also applied a Barton bandage for 10 days. Removed the appliances in 35 days; the two bicuspids were slightly weak on account of the alveolar process between them having exfoliated, but they gradually grew stronger.

Case No. 6. P—. Apprentice seaman. Fracture of the ascending ramus, May 12, 1915. Patient received May 22, 1915, for treatment.

Placed Angle's fracture bands on the first molars on the left side and on the second molars on the right; wired the teeth also, to hold more firmly, and applied a Barton bandage. Removed the bandages June 12, 1915, and the wires June 24, 1915. The jaws were soon in their normal condition and use of them good.

In all of the above cases the mouth and gums remained in a normal, healthy condition, and articulation and occlusion as before injury. The application of the wires and appliances was completed in less than two hours; the bandages were changed every second day and the gums painted with iodin.

In both No. 3 and 4, giving a past history of syphilis, there was a delay in bone formation.

I am sure we had better results with this method than with the vulcanite splint method, and good results in all cases.

DIVING OPERATIONS IN CONNECTION WITH THE SALVAGE OF THE U. S. S. "F-4."

By G. R. W. French, Passed Assistant Surgeon, United States Navy.

The ventilation of the helmet was accomplished by utilizing compressed air taken from torpedo flasks. In diving to depths below 100 feet 12 flasks were used. Figure 1 is a digram to show the method

of air supply to the divers in deep water and to the recompression chamber. The air was obtained from a bank of 12 torpedo air flasks, each flask having a capacity of 11 cubic feet and charged to 2,500 pounds per square inch on the U. S. S. *Maryland* and the U. S. S. *Alert* by torpedo air compressors. Care was taken to have the air in the flasks as pure as possible. This was obtained by delivering outboard air to the intake of the air compressor. On the *Maryland* air to the compressors was taken from a large wind-sail leading down to the intake of the compressors. On the *Alert* the intake of the compressors was outboard. The air was strained through six Navy Standard air separators before being stored in the torpedo air flasks. and the air in the flasks was allowed to cool before using. Castor oil was used as a lubricant for the compressors and the smallest practicable amount used, with the compressors charging so as to insure freedom from oil fumes.

The arrangement of the 12 torpedo air flasks installed on an ordinary coal barge was as follows:

Four were connected on the line all of the time by one-half inch flexible copper tubing (regular torpedo charging pipe). For diving the air could be conducted from one or from all four flasks through valve No. 1, reducing valve; valves Nos. 2 and 3, safety valves; and into the supply tank (2 cubic feet testing tank); then to the manifold, which was arranged so as to supply four divers at the same time if necessary. The supply tank allowed air to back up, keeping the supply constant and forming a cushion to protect the line should the delivery be interrupted from any cause. The safety was set to prevent any oversupply of air and gages were installed on several points in the line, as shown, for convenience in controlling the pressure. A second means of getting air to the manifold was through valve No. 4 and valves Nos. 3 and 5. Should the reducers in this path fail in operation, a by-pass was provided through valve No. 6. The supply was thus obtained through any one of the three paths, and should one line fail another could be put into operation immediately. The recompression chamber was connected up over the same paths as the diving manifold and supplied through valve No. 7, by means of which, together with an exhaust valve, the pressure was controlled and the air renewed as required.

In the first five dives the by-pass was not installed. It was found, however, in dives Nos. 4 and 5, made at the same time, that the reducing valves were not altogether satisfactory and that the by-pass was necessary.

For diving in less depths than 100 feet only four torpedo air flasks were used. These were installed in a motor sailing launch which could be more readily maneuvered than the coal barge. Figure

2 is a diagram to show arrangement of air supply on the motor sailing launch. Air from the charged torpedo air flasks is conducted by flexible copper tubing to the manifolds (1); from this it passes valves (2) and (3) to the air cell (4), fitted with a gauge for regulating pressure. The cell acts as a low-pressure accumulator, serves to keep the flow constant, and furnishes a cushion in case of backing up of the pressure. The air is distributed to the divers' hose through valves (5) and (6); no reducing valve was utilized, the flow of air to the divers being regulated by valves (2) and (3). The necessity for two valves was in case one failed to operate. The forward part of the launch was decked over by boards placed on the thwarts, and the diving ladder hooked on the gunwale amidships on either side. With this arrangement two divers may operate at the same time.

Sufficient pressure on the low-pressure air line, above water pressure, had to be maintained to insure a proper circulation of air through the diver's helmet. The low-pressure gage was usually set at 50 pounds, and as the diver descended the pressure was raised slowly, 25 pounds at a time, instead of setting it at the maximum required pressure at once.

Pressure was allowed to fall 25 pounds at a time as the diver ascended, depending on his depth, the object being to prevent strain on the diving hose.

In the first five dives the maximum water pressure was estimated from 130 to 138 pounds per square inch excess pressure. The low-pressure air line was maintained at 225 pounds while the diver was at his maximum depth. As the diver progressed, however, it was found that 175 pounds on the low-pressure line supplies adequate air for one diver at 275 feet. In diving to the shallower depths (less than 100 feet) from the motor sailing launch with two divers down at the same time, the maximum pressure necessary on the air cell was 100 pounds. The fine adjustment of air supply was made by the diver himself by means of the Stillson air control valve interposed in the diving hose 3 feet from the diver's helmet.

At no time did the divers suffer from lack of ventilation. There was always an abundance of air and the air used was in accordance with theoretical calculation, i. e., $4.5 \times \left[1 + \frac{\text{(depth of sea water)}}{33}\right]$ cubic feet was considered the maximum necessary amount of air per minute to keep the CO_2 in the diver's helmet at or below 1 per cent of an atmosphere with the diver at hard work.

The pressure in the torpedo air flask was not allowed to fall below 500 pounds per square inch before another flask was opened into the line.

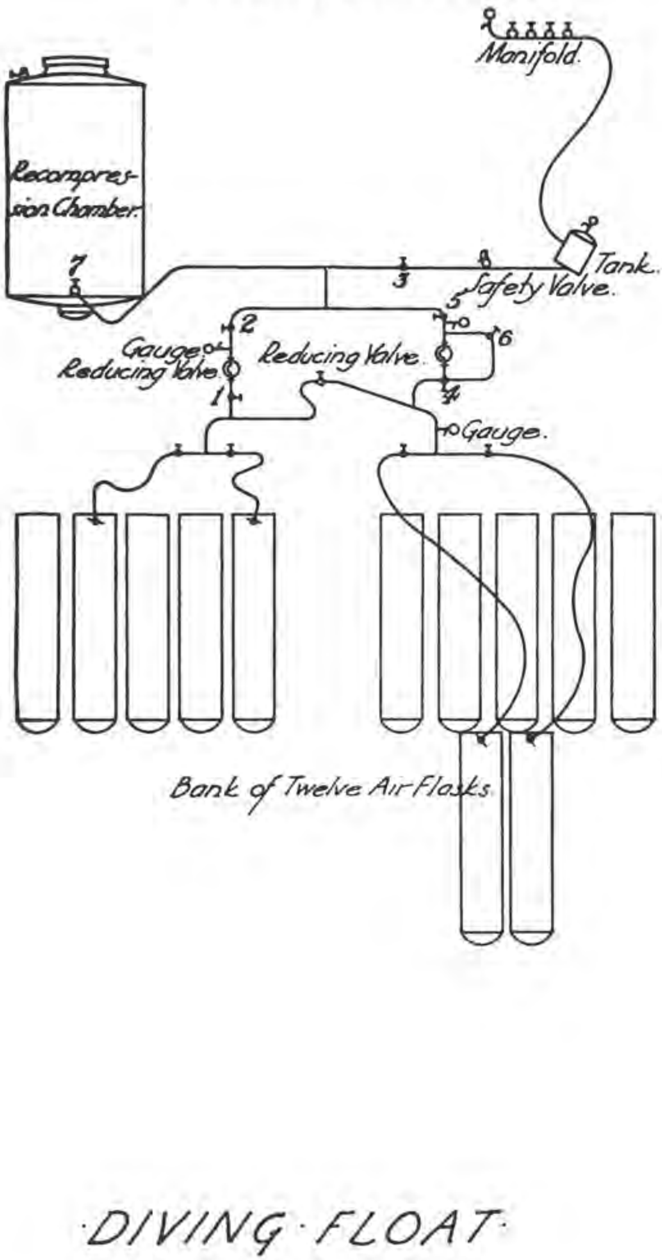


Fig. 1.—For description see text.

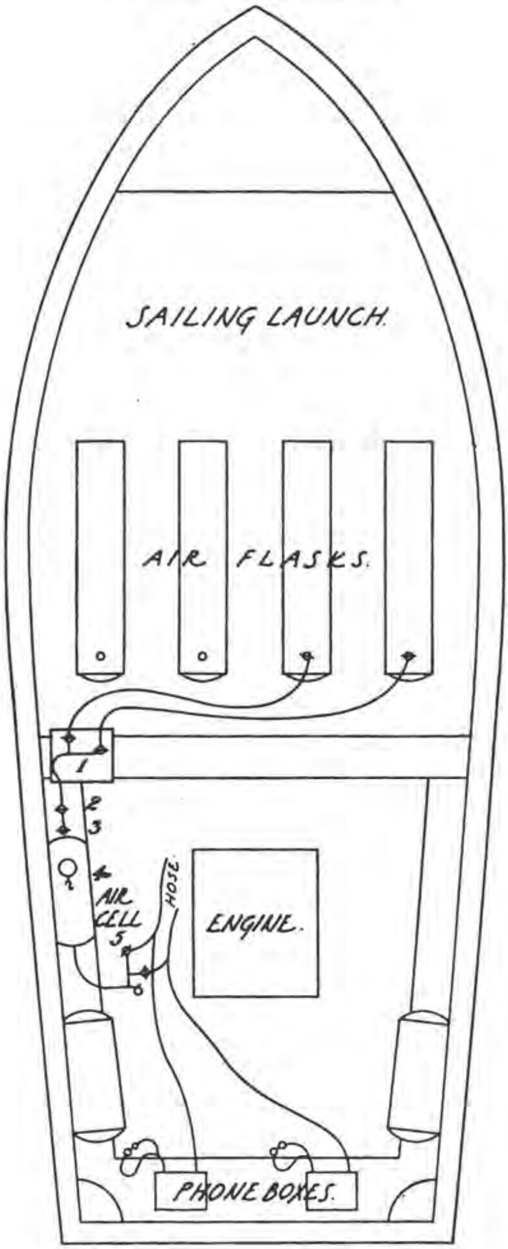


Fig. 2.—For description see text.

The length of time for each flask was estimated as follows:

C—capacity of torpedo air flask.

A—atmospheres excess pressure in flask.

W—depth of water.

D—number of divers.

One atmosphere of the torpedo air flask was considered necessary to charge the helmet and hose to the pressure of the water. Hence in an 11 cubic foot flask charged to 2,500 pounds:

C=11 cubic feet.

A=171 as 500 pounds were left in the flask.

171−34=137 torpedo air flask atmospheres available for helmet ventilation or 136, allowing one atmosphere for charging helmet and hose. Hence in a dive to W=300 feet, one 11 cubic foot flask should last

$$\frac{C\times(A-35)}{D\times 4.5\times\left(1+\frac{W}{33}\right)}$$

or

$$\frac{11\times(171-35)}{1\times 4.5\left(1+\frac{300}{33}\right)}$$

or $\frac{1,496}{45.45}$=32 minutes for each 11 cubic foot air flask charged to 2,500 pounds if used at the rate of 4.5 cubic feet per minute, measured at the working pressure of 300 feet of sea water.

For the ordinary dive at 275 to 300 feet approximately two fully charged air flasks were used by one diver in the ordinary 20 to 30 minute dive, including decompression time in water. As fast as flasks were emptied they were immediately sent to the ships, where they were recharged and returned.

PHYSICAL CONDITION OF THE DIVERS.

A careful physical examination of the divers on April 14, 1915, showed:

Crilley—In good physical condition.

Nielson—In good physical condition.

Loughman—In good physical condition.

Drellishak—Rapid pulse (90) and a reduplication of the first heart sound. It was considered from previous experience in Drellishak's case that he could do the experimental diving and show no ill effects. After consultation with the medical officers of the *Maryland* it was decided to use him in his regular turn.

	Nielson.	Drellishak.	Crilley.
Height .... inches..	66	67	66½
Weight .... pounds..	152	142	127½
Chest:			
Mean .... inches..	37	36	33
Inspiration .... do....	38¼	38½	34½
Expiration .... do....	35½	33¾	31
Neck .... do....	15	14½	14
Right arm .... do....	12	14½	10½
Left arm .... do....	11¾	11	10
Right forearm .... do....	11½	11	10½
Left forearm .... do....	11½	10½	10
Waist .... do....	31½	30	29
Hips .... do....	36½	36	33½
Right leg .... do....	20½	19	18½
Right calf .... do....	14½	13½	14
Left calf .... do....	14½	13½	13½
Right ankle .... do....	8½	9	8½
Left ankle .... do....	8½	9	8½

DECOMPRESSION.

Stage decompression was used in all the dives. Owing to a tendency to rough weather and the great discomfort to the divers on the decompression ladder, the shortest reasonably safe decompression time in water was deemed advisable. In the salvage work on the *Empress of Ireland* men were brought up from 165 feet after a 30-minute exposure without decompression and placed in a recompression chamber, pressure applied corresponding to 165 feet, and they were decompressed in this chamber according to the British Admiralty tables with no ill effects, very few minutes elapsing, however, before they were in the chamber and under pressure.

According to the theory of stage decompression, if pressure is reduced so that:

Absolute pressure : reduced absolute pressure $=2.3:1$ no symptoms of caisson disease will result.

In figuring the first step for a 300-foot dive, taking into account atmospheric pressure of 14.7 pounds to the square inch, equality expressed in terms of sea water 33 feet:

$$333:x=2.3:1$$

or

$$2.3\ x=333$$

$$x=145$$

$145-33$ (atmospheric pressure) $=112$ feet for the first stop. In all cases where decompression is hurried the only safe way is to skip the first stops. Hence our first stop on decompression was taken at 90 feet. With a recompression chamber ready for immediate use and previous experience in deep work, together with the experience of the divers on the *Empress of Ireland*, this was considered safe as far as

caisson disease was concerned, and lessened the likelihood of oxygen poisoning.

For **arrangement** of decompression ladder and descending line see figure 3.

The only alarming attack of caisson disease was in Loughman's case. (See dive No. 4.) None of the cases showed any paralytic symptoms; no case of sand hog's itch was observed in any of the diving, which was contrary to our experience in the diving tank. Loughman did show subcutaneous hemorrhages, however. Joint pains were observed. Vertigo, nausea, vomiting, and gastric distention were experienced by all the divers except Crilley, and these occurred with and without joint pains. Symptoms of caisson disease were as a rule delayed and did not come on until some time after pressure was normal. On the whole the symptoms of caisson disease were more severe than those experienced in the experimental tank diving. No real deep diving should be undertaken without a recompression tank ready for immediate use. It is considered impracticable on the whole, however, to set a decompression time in water that will obviate all symptoms of caisson disease and make diving practicable in great depths, unless the exposure to high pressure is short.

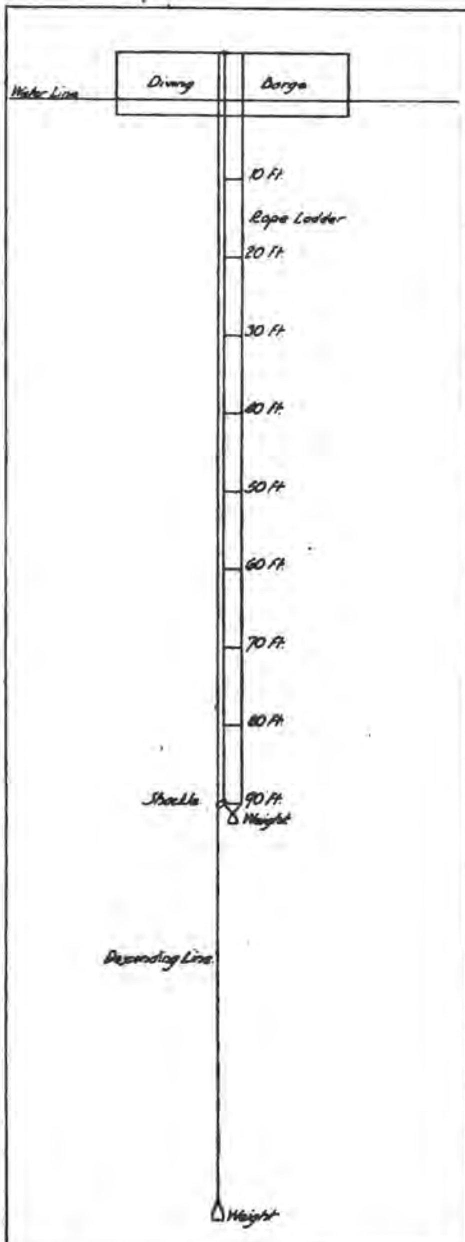


Fig. 3.—Decompression ladder and descending line.

DIVING TELEPHONES.

The Stillson three-wire diving telephones were used in all the diving. Communication with the divers was maintained at all times, and this type of telephone was found very satisfactory.

LOCAL CONDITIONS.

Aside from a tendency to rough weather at times, local conditions were ideal. The water was clear, with a surface temperature of 70° F., and there was practically no tide. On a clear day it was possible to see 100 feet below the surface with a water glass. The divers state that at a depth of 300 feet on a bright, sunny day it was possible to see the entire length of the submarine, and with the sun overcast it was possible to see about 40 feet.

DIVE NO. 1. APRIL 14, 1915.

Depth of water, 288 to 306 feet. No descending line used, the diver descending on one of the steel cables passed underneath the submarine. Line tending at an angle instead of straight up and down.

Diver, Frank Crilley, chief gunner's mate, United States Navy.

Entered water, 9.52 a. m.
On submarine *F-4*, 10 a. m.
Started ascent, 10.14 a. m.

On decompression ladder:

Bottom rung, 90 feet, 10.17 a. m.
Second rung, 80 feet, 10.21 a. m.
Third rung, 70 feet, 10.24 a. m.
Fourth rung, 60 feet, 10.29 a. m.
Fifth rung, 50 feet, 10.36 a. m.
Sixth rung, 40 feet, 10.46 a. m.
Seventh rung, 30 feet, 11.01 a. m.
Eighth rung, 20 feet, 11.21 a. m.
Ninth rung, 10 feet, 11.41 a. m.
Surface, 12.01 p. m.

On coming to the surface it was found that some water had entered the diver's suit by way of the cuffs, due to the diver working with his hands over his head. The diver was wet and cold but otherwise showed no ill effects from his dive. He reported a hard, sandy, flat bottom, with very little coral formation. No work was attempted on this dive outside of getting to different parts of the submarine.

DIVE NO. 2. APRIL 14, 1915.

Conditions same as for dive No. 1. Depth of water, from 288 to 306 feet.

Diver, F. C. G. Nielson, chief gunner's mate, United States Navy.

Entered water, 2.26 p. m.
On bottom, 2.34 p. m.
Started ascent, 2.55 p. m.

On decompression ladder:

Bottom rung, 90 feet, 3 p. m.
Second rung, 80 feet, 3.01 p. m.
Third rung, 70 feet, 3.04 p. m.
Fourth rung, 60 feet, 3.11 p. m.
Fifth rung, 50 feet, 3.21 p. m.
Sixth rung, 40 feet, 3.31 p. m.
Seventh rung, 30 feet, 3.46 p. m.
Eighth rung, 20 feet, 4.06 p. m.
Ninth rung, 10 feet, 4.26 p. m.
Surface, 4.46 p. m.

No ill effects were noticed. Diver was wet and chilly, otherwise normal. Nielson made a thorough exploration of the submarine, crawling over it and walking about.

DIVE NO. 3. APRIL 15, 1915.

Made under same conditions as dives 1 and 2. Depth of water, 288 to 306 feet.

Diver, S. J. Drellishak, chief gunner's mate, United States Navy.

Entered water, 3.17 p. m.
On bottom, 3.21 p. m.
Started ascent, 3.39 p. m.

On decompression ladder:

Bottom rung, 90 feet, 3.48 p. m.
Second rung, 80 feet, 3.56 p. m.
Third rung, 70 feet, 3.59 p. m.
Fourth rung, 60 feet, 4.04 p. m.
Fifth rung, 50 feet, 4.14 p. m.
Sixth rung, 40 feet, 4.24 p. m.
Seventh rung, 30 feet, 4.39 p. m.
Eighth rung, 20 feet, 4.56 p. m.
Ninth rung, 10 feet, 5.16 p. m.
Surface, 5.36 feet.

Drellishak expended considerable effort in looking things over on the bottom. Five minutes after coming to the surface he was taken with slight pain in the shoulder and elbow joints. He was placed in the recompression chamber at 5.40 p. m., Mr. Stillson accompaning him, and pressure applied as follows:

Pressure 17½ pounds at 5.41 p. m.
Pressure 10 pounds at 5.56 p. m.
Pressure 5 pounds at 6.11 p. m.
Out of chamber, 6.13 p. m.

Drellishak was evidently all right after this dive, although a little tired and exhausted. At 12 p. m. he was again seized with pains in the shoulder and elbow joints. At 1 a. m. he was again replaced in the recompression chamber, as pains had by this time become very severe. Crilley accompanied him. The pressure was run up to 30 pounds, when all symptoms of pain disappeared. Three hours were spent in decompressing from 30 pounds. Upon removal from chamber diver's condition was good, all symptoms had disappeared and did not return. Pulse was a little rapid (94) for the next day.

DIVE NO. 4. APRIL 17, 1915.

Conditions same as for dives 1, 2, and 3. Depth of water, 288 to 306 feet.

Diver, W. F. Loughman, chief gunner's mate, United States Navy.

Entered water, 10.39 a. m.
On bottom, 11.12 a. m.

Diver spent 15 minutes at 90 feet adjusting apparatus, etc. Began ascent at 11.24 a. m., but found himself foul at 250 feet. He descended to the bottom again to try to clear himself, but was unsuccessful. Began ascent again at 11.35 a. m. and remained at a depth of 250 feet. Diver Crilley was then sent down. Loughman was cleared and brought up to the depth of 100 feet at 2.25 p. m. Instead of remaining and undergoing his decompression, Loughman, in spite of all telephone instructions, climbed up the decompression ladder of his own accord to the depth of 60 feet, which he reached at 2.45 p. m.

Observations were made through water glass.

At 2.50 p. m. he had climbed up to the depth of 40 feet. Here he stopped and collapsed at 3.05 p. m., failing to answer the telephone. He was brought to the surface at once, diving suit, weights, and clothes were cut from him. Upon his first arrival at the surface he was conscious and able to talk, but he collapsed a moment later. He was rushed into the recompression chamber and the pressure run up to 75 pounds.

TIME IN RECOMPRESSION CHAMBER.—Entered chamber at 3.10½ p. m., accompanied by Passed Assistant Surgeons Harry A. Garrison and G. R. W. French, United States Navy, and Diver Crilley. Loughman was unconscious, cyanotic, not breathing, and pulse not palpable. Artificial respiration started as pressure was applied. Strychnin given hypodermically. Patient suddenly recovered as pressure reached 75 pounds. At 3.14 p. m. patient conscious, breathing, and sitting up; rational, and evidently all right.

Pressure applied to recompression chamber:

75 pounds at 3.14 p. m.
70 pounds at 3.18 p. m.
75 pounds at 3.18½ p. m.
70 pounds at 3.20 p. m.
60 pounds at 3.25 p. m.

It was realized that because of prolonged exposure at high pressure pneumonia was likely to result, and pressure was reduced as rapidly as possible to obviate this danger.

57½ pounds at 3.30 p. m.
50 pounds at 3.36 p. m.
45 pounds at 3.43 p. m.
40 pounds at 3.47 p. m.
35 pounds at 3.52 p. m.
30 pounds at 4.02 p. m.
25 pounds at 4.17 p. m.
20 pounds at 4.37 p. m.

Decompression at this time had been progressing well. Loughman showed no untoward symptoms, was sitting up and cheerful, and had telephoned the condition of all lines on the submarine to Mr. Stillson. At the pressure of 20 pounds he was seized with an attack of joint pains in both knees, so the pressure was increased. The pressure at 4.58 p. m. was 25 pounds. Loughman was relieved of joint pains and was apparently all right.

24 pounds at 5.07 p. m.
24 pounds at 5.35 p. m.
23 pounds at 5.37 p. m.
22½ pounds at 5.40 p. m.
21 pounds at 5.50 p. m.
20 pounds at 5.54 p. m.

At 20 pounds joint pains again became severe. Pressure increased to 25 pounds.

25 pounds at 5.57 p. m.

Untoward symptoms; vomiting, and pains in abdomen.

30 pounds at 5.59 p. m.

A second attack of vomiting resulted some minutes after pressure was increased.

37½ pounds at 6.06 p. m.
30 pounds at 6.10 p. m.
25 pounds at 6.13 p. m.
20 pounds at 6.25 p. m.
18 pounds at 6.28 p. m.

Joint pains marked.

20 pounds at 6.29½ p. m.
22½ pounds at 6.30 p. m.

20 pounds at 6.41 p. m.
22½ pounds at 6.45 p. m.
25 pounds at 6.47 p. m.
30 pounds at 6.52 p. m.
33 pounds at 7.05 p. m.
35 pounds at 7.16 p. m.
30 pounds at 7.25 p. m.

Patient's condition not exceedingly good. The only symptoms, however, were the joint pains, which caused him to kick and scream. No other untoward symptoms were present, as vomiting had ceased by this time.

25 pounds at 7.32 p. m.
22½ pounds at 7.40 p. m.
20 pounds at 7.49 p. m.
22½ pounds at 8.03 p. m.
21½ pounds at 8.10 p. m.

Joint pains persist.

After consultation with Dr. Garrison and Dr. Curl it was decided that the chamber had been worked to the limit. It was decided to decompress by gradual instead of stage decompression.

20 pounds at 9.03 p. m.
18 pounds at 9.14 p. m.
17 pounds at 9.33 p. m.
16 pounds at 9.59 p. m.
15 pounds at 10.20 p. m.
14 pounds at 10.35 p. m.
13 pounds at 10.50 p. m.
12 pounds at 11.02 p. m.
10 pounds at 11.14 p. m.
9 pounds at 11.23 p. m.
8 pounds at 11.32 p. m.
7 pounds at 11.40 p. m.
6 pounds at 11.48 p. m.
5 pounds at 11.56 p. m.
4 pounds at 12.02 a. m.
3 pounds at 12.12 a. m.
2 pounds at 12.18 a. m.
1 pound at 12.26 a. m.

Patient was removed from the recompression chamber and taken to the sick bay of the *Maryland*. It was realized that the patient was not completely desaturated and was suffering from a severe attack of caisson disease. There was no central involvement, i. e., no paralysis of any sort, and it was considered that the best chance for the patient was by other means of treatment.

April 18, 1915. Upon removal from chamber patient was conscious and complaining bitterly of joint pains. His condition became worse during the next three hours as a result of caisson dis-

ease. Large areas of subcutaneous hemorrhages appeared over chest and abdomen; body was cold, and the pulse was not palpable at the wrist. Given morphin hypodermically.

Treatment: Hypodermoclysis, proctoclysis, and intravenous infusions of normal salt solution and adrenalin. Only 50 c. c. of urine were secreted during the first 24 hours, which contained a large amount of blood and many blood and epithelial casts. Temperature subnormal. Patient's condition precarious. Given morphin to relieve pain, which was extreme. Vomiting at intervals. Inhalations of oxygen given.

April 19, 1915. Patient recovering from his extreme shock, hemorrhagic areas fading, marked distention of abdomen and extreme tenderness over stomach; joint and bone symptoms severe, especially over back and chest, and unable to be moved on account of pain. Three hundred c. c. of urine voided; still contains blood and casts.

April 20, 1915. Patient's general condition markedly improved. Pulse full and strong; marked tympanites present, but this was readily relieved by rectal tube and pituitrin. Careful physical examination to-day shows a typical bronchopneumonia of both lungs. Urine normal in amount. Contains a trace of albumin, hyaline and granular casts, and many leukocytes. The clinical picture from this time on presented that of a typical bronchopneumonia. Patient in good condition. Expectoration and cough slight. The case ran an uneventful course. He improved gradually and at no time after April 20 did his condition seem precarious.

May 5, 1915. Patient convalescent and able to sit up. Appetite good and no after effects from his attack of caisson disease. Urine showed occasional granular casts and a few white cells. Examination showed a small amount of fluid in left pleural sac. Transferred this date to the U. S. Army transport *Sheridan* for further treatment to the United States naval hospital, Mare Island, Cal.

June 30, 1915. Patient has completely recovered with no ill effects.

DIVE NO. 5. APRIL 17, 1915.

(Crilley's rescue dive.)

Conditions same as dive No. 4, except that there were two divers down at once. Greatest depth of dive estimated at 265 feet.

Crilley entered the water at 12 noon. He was working on Loughman's line for about one hour at depths ranging from 265 to 120 feet. Accurate time of various depths could not be taken as too many emergencies were arising. At 1.09 p. m. he had the lines cleared and

started to come to the surface for another line to make fast to Loughman's line.

70 feet at 1.10 p. m.
65 feet at 1.19 p. m.
60 feet at 1.21 p. m.
55 feet at 1.23 p. m.
50 feet at 1.26 p. m.
45 feet at 1.29 p. m.
40 feet at 1.32 p. m.
35 feet at 1.40 p. m.
Surface at 1.50 p. m.

Change of lines made and Crilley started down again instantly.

120 feet at 1.51 p. m.
Surface at 1.53 p. m.
15 feet at 1.55 p. m.
10 feet at 2.04 p. m.
Surface at 2.11 p. m.

Diver was working on fouled lines at these estimated depths during this time.

Crilley was placed in the recompression chamber and pressure run to 30 pounds. He was decompressed rapidly in order to have the chamber for Loughman, coming out at 3.07 p. m. Not knowing the exact depths and stops that Crilley had made, it was decided to again take him to the recompression chamber with Loughman, Dr. Garrison, and the writer. It would be inadvisable to lower pressure on Loughman and take Crilley into the chamber in case he should later develop caisson disease.

See dive No. 4 for recompression-chamber time. In chamber, Drs. Garrison and French, divers Crilley and Loughman.

Effects.—Dr. Garrison. In taking pressure suddenly Dr. Garrison failed to clear his ears quickly enough on the first ten pounds and bled a little from the nose. Examination the next morning showed that he had sustained a rupture of both ear drums. The perforations were slight, and healed in a week without affecting his hearing. No symptoms of caisson disease.

Dr. French. Six hours after coming out of chamber Dr. French developed bone pain in left tibia, especially about the knee. Pains wore off in about fifteen hours.

Diver Crilley. Joint pains in both elbows. Wore off in about five hours.

DIVE NO. 6. MAY 7, 1915.

Diver, F. C. G. Nielson, chief gunner's mate, United States Navy. Depth of water, 270 to 275 feet.

Entered water at 4.22 p. m.
On bottom at 4.27 p. m.
Started ascent at 4.42 p. m.

On decompression ladder:

Bottom rung, 90 feet, 4.48 p. m.
Second rung, 80 feet, 4.51 p. m.
Third rung, 70 feet, 4.55 p. m.
Fourth rung, 60 feet, 5.00 p. m.
Fifth rung, 50 feet, 5.07 p. m.
Sixth rung, 40 feet, 5.17 p. m.
Seventh rung, 30 feet, 5.32 p. m.
Eighth rung, 20 feet, 5.52 p. m.
Ninth rung, 10 feet, 6.12 p. m.
Surface, 6.32 p. m.

No ill effects from this dive.

(NOTE.—Regular descending line used in this dive and in all following dives.)

Nielson landed about 40 feet from the inshore side of the submarine and walked over to her to get position of her lifting cables. Sun overcast and diver could see about 40 feet on the bottom.

DIVE NO. 7. MAY 8, 1915.

Diver, Crilley. Depth of water 270 to 275 feet.

Entered water 4.07 p. m.
On bottom 4.12 p. m.
Started ascent 4.39 p. m.

On decompression ladder:

Bottom rung, 90 feet, 4.45 p. m.
Second rung, 80 feet, 4.48 p. m.
Third rung, 70 feet, 4.53 p. m.
Fourth rung, 60 feet, 5 p. m.
Fifth rung, 50 feet, 5.10 p. m.
Sixth rung, 40 feet, 5.20 p. m.
Seventh rung, 30 feet, 5.35 p. m.
Eighth rung, 20 feet, 5.55 p. m.
Ninth rung, 10 feet, 6.15 p. m.
Surface, 6.40 p. m.

No ill effects. Diver landed on offshore side of submarine, walked about and explored lines. No extra hard exertion on this dive.

DIVE NO. 8. MAY 9, 1915.

Diver, Drellishak. Depth of water 270 to 275 feet.

Entered water 4.09 p. m.
On bottom 4.13 p. m.
Started ascent 4.32 p. m.

On decompression ladder:

Bottom rung, 90 feet, 4.37 p. m.
Second rung, 80 feet, 4.40 p. m.
Third rung, 70 feet, 4.45 p. m.
Fourth rung, 60 feet, 4.52 p. m.
Fifth rung, 50 feet, 5.02 p. m.
Sixth rung, 40 feet, 5.12 p. m.

Seventh rung, 30 feet, 5.27 p. m.
Eighth rung, 20 feet, 5.47 p. m.
Ninth rung, 10 feet, 6.07 p. m.
Surface, 6.32 p. m.

Careful physical examination was made of Drellishak at 10 a. m. Pulse 92 and regular; blood pressure, 120. Slight reduplication of first heart sound. On arrival at the surface, pulse 90, with tendency to drop an occasional beat. Otherwise he seemed to be in good condition. At 7.45 p. m. he was suddenly seized with dizziness and nausea; he staggered about and was hurried to the recompression chamber. Pulse 75 and very irregular.

In recompression chamber with Mr. Stillson:

25 pounds at 7.55 p. m.
22½ pounds at 8.10 p. m.
20 pounds at 8.18 p. m.
15 pounds at 8.35 p. m.
10 pounds at 8.55 p. m.
5 pounds at 9.25 p. m.
Out at 9.55 p. m.

Examination showed pulse to be 75, with irregular dropping of every third or fourth beat. Given strychnin and tincture of digitalis at 11 p. m. and kept at absolute rest. Feeling better at the end of 24 hours and allowed to get up. Slight gastric distention and stomach deranged for three days, at the end of which time heart was again regular with reduplication of first heart sound. Drellishak was a raceboat man in 1907 and has not been in the best physical condition since leaving New York.

DIVE NO. 9. MAY 10, 1915.

Diver, Nielson. Depth of water, 270 to 275 feet.

Entered water at 11.55 a. m.
On bottom, 11.58 a. m.
Started ascent, 12.26 p. m.
Reached 250 feet, 12.27 p. m.
Started down, 12.28 p. m.
On bottom, 12.29 p. m.
Started ascent, 12.32 p. m.

On decompression ladder:

Bottom rung, 90 feet, 12.36 p. m.
Second rung, 80 feet, 12.48 p. m.
Third rung, 70 feet, 1 p. m.
Fourth rung, 60 feet, 1.10 p. m.
Fifth rung, 50 feet, 1.20 p. m.
Sixth rung, 40 feet, 1.35 p. m.
Seventh rung, 30 feet, 1.50 p. m.
Eighth rung, 20 feet, 2.15 p. m.
Ninth rung, 10 feet, 2.40 p. m.
Surface, 3.05 p. m.

Placed in recompression chamber accompanied by Dr. French.

In recompression chamber:

25 pounds at 3.10 p. m.
20 pounds at 3.15 p. m.
15 pounds at 3.25 p. m.
10 pounds at 3.45 p. m.
5 pounds at 4.10 p. m.
Out, 4.35 p. m.

In this dive Niel on attempted to pass a line through the lifting shackle at the stern of the submarine. He had worked to the limit of his time when he started for the surface at 12.26 p. m. When he started for the surface his lines became fouled (descending line, reaving line, and his own lines) and he was forced to clear himself, cutting lines, passing around, etc. Working with his hands over his head, his suit became filled with water, which greatly increased his muscular efforts in reaching the surface. He telephoned that he was exhausted and requested as short a decompression time as possible. At the time, it was thought that at the beginning of ascent he was moving steadily toward the surface and he did not notify us that he descended again until 12 hours later.

Upon reaching the surface he was exhausted and had very little strength. He revived under treatment in the recompression chamber and was given hot coffee. On removal from chamber he was apparently in good condition. About two hours after leaving recompression chamber he ate some pineapple and vomited it soon after. He did not think seriously about his condition at this time. An hour later he stated that he felt a little light headed. The next morning he was put to bed. His only complaint was that upon getting up he felt dizzy and sick at his stomach. There was no joint pain, sand hog's itch, or any other symptoms, excepting tongue being coated. Given a course of calomel and kept quiet. May 12, 1915, improved; vertigo disappearing; up and about. May 14, 1915, recovered from ill effects.

NOTE.—Decompression time in this case was evidently too short. Allowance was made for 30 minutes' exposure under ordinary conditions, when actually the man was performing hard work for 41 minutes.

DIVE 10. MAY 12, 1915.

Diver, Crilley. Depth of water, 270 to 275 feet.

Entered water at 9.25 a. m.
On bottom at 9.29 a. m.
Started ascent at 9.35 a. m.

On decompression ladder:

Bottom rung, 90 feet, at 9.39 a. m.
Second rung, 80 feet, at 9.42 a. m.

Third rung, 70 feet, at 9.45 a. m.
Fourth rung, 60 feet, at 9.50 a. m.
Fifth rung, 50 feet, at 9.58 a. m.
Sixth rung, 40 feet, at 10.09 a. m.
Seventh rung, 30 feet, at 10.24 a. m.
Eighth rung, 20 feet, at 10.44 a. m.
Ninth rung, 10 feet, at 11.15 a. m.
Surface, at 11.16 a. m.

This dive was made as an observation dive to ascertain position of stern lines. With two of our divers suffering from a slight attack of caisson disease, it was decided to use the recompression chamber as routine and insure all divers being available for duty.

In recompression chamber with Drellishak at 11.19 a. m.

20 pounds at 11.20 a. m.
15 pounds at 11.40 a. m.
10 pounds at 12.05 p. m.
5 pounds at 12.55 p. m.
Out at 1.10 p. m.

No ill effects.

DIVE NO. 11. MAY 15, 1915.

Diver, Crilley. Depth of water, 270 to 275 feet.

Entered water, 9.32 a. m.
250 feet, 9.34 a. m.
On bottom, 9.38 a. m.
Started ascent, 9.42 a. m.

On decompression ladder:

Bottom rung, 90 feet, at 9.46 a. m.
Second rung, 80 feet, at 9.49 a. m.
Third rung, 70 feet, at 9.52 a. m.
Fourth rung, 60 feet, at 9.57½ a. m.
Fifth rung, 50 feet, at 10.04½ a. m.
Sixth rung, 40 feet, at 10.15 a. m.
Seventh rung, 30 feet, at 10.30 a. m.
Eighth rung, 20 feet, at 10.50 a. m.
Ninth rung, 10 feet, at 11.10 a. m.
Surface, at 11.30 a. m.

In recompression chamber accompanied by Drellishak.

25 pounds at 11.36 a. m.
20 pounds at 11.50 a. m.
15 pounds at 12.20 p. m.
10 pounds at 12.35 p. m.
5 pounds at 1.05 p. m.
Out, at 1.45 p. m.

This was another observation dive made to determine the position of lifting cables on the submarine.

No ill effects.

DIVING IN THE SHALLOWER DEPTHS.

Raising operations were started and the submarine was moved up and inshore. One dive was made at a depth of 83 feet and an inspection of the boat made. At a depth of 54 feet four dives and further inspections were made. At a depth of 42 feet a spell of heavy weather took place. The lifting chains were dropped but not before severe damage had resulted to the submarine. In accordance with orders from the Navy Department, all raising operations were stopped pending the arrival of pontoons.

Twenty dives were made at the depth of 42 feet; at this depth two divers were usually down at a time and worked in spells as long as three hours.

Decompression was in accordance with the British Admiralty tables.

Aside from the satisfactory helmet ventilation by compressed air there is nothing of medical importance to report.

REPORT ON THE RECOVERY, IDENTIFICATION, AND DISPOSITION OF THE REMAINS OF THE CREW OF THE "F-4."

By W. Seaman, Surgeon, United States Navy.

On the forenoon of March 25, 1915, the submarine *F-4* failed to return to the surface from a submerged run, and remained sunken outside the harbor of Honolulu until raised to the surface August 29, 1915, a period of more than five months.

First located at a depth of 305 feet, she was gradually worked into a depth of only 40 feet by May 25. Heavy swells wrecked the apparatus at that time employed, and salvage work ceased until late in August, when new methods were employed with success.

In May divers reported a large rent or hole in the structure of the submarine which was considered to have been caused by the attempts at salvage. Later, in shallow water, these openings were screened with canvas to exclude marine life from the remains. An attempt was made, however, before the screening, to remove, if possible, the remains through the opening, which was of sufficient size to permit entrance. Owing to the position of the boat, it resting nearly bottom-side up, the battery plates had become loosened and many of them were falling; it was, therefore, considered too dangerous an undertaking for the divers to attempt any work inside the vessel at that time.

Opinions as to the condition of the remains among professional men varied from complete obliteration to a fair state of preservation. There was no data or experience upon which to base reasonable con-

clusions. These opinions were founded for the most part on the various theories advanced as to the cause of the accident. It was believed by some that a battery explosion, not caused by the admission or immediately followed by the admission of sea water, might do either one of two things—produce full escharotic action on the tissues by more or less intimate contact with them, or instantly kill by asphyxia, with no further immediate action on the tissues. Assumption that the entrance of sea water to the vessel may have been the direct or contributing cause for the disaster was a basis for the theory that the profuse effusion of chlorin gas may have bleached and preserved the bodies. Eliminating the action of the chlorin gas, it was thought by some that the entrance of sea water would so quickly neutralize the acid as to limit or entirely annul the action of the acid as an escharotic. Still others felt that the great pressure to which the vessel had been subjected would so rapidly force the contents of the fuel-oil tanks into the interior of the vessel that every object in her would be coated with this liquid, which would probably assist in repelling the action of any other. The activities of fish and more minute marine life was also given consideration, but in the absence of any positive data it was entirely a matter of guesswork. The condition of the remains threw no light upon the accident or its results, nor was it possible to determine whether any of the theories enumerated above were correct. A condition noted in all the four bodies recovered from the middle compartment, however, was the change to adipocere in all the adherent tissues. For example, while all the crania of those recovered were entirely denuded of tissue, the tissues of the eye were of the consistency of tallow, with no putrefactive odor.

Early in the salvage operations, when it was hoped the bodies might be recovered, the subject of the care, identification, and disposition of the remains was carefully considered by Surgeon H. C. Curl of the U. S. S. *Maryland*. Surgeon Curl was present when the boat was brought to dry dock, made the first search for remains and was present at the recovery of the first body, but was compelled to leave on the *Maryland* before the work was completed, when that vessel was ordered to San Francisco. His methods, however, were followed in so far as the conditions encountered made them practicable. Assistant Dental Surgeon Halleck, also of the *Maryland*, suggested incidentally, a method of securing finger prints on dental wax which might have proved valuable had there been opportunity to employ it. Surgeon Trotter in charge of the Marine Hospital Service at Honolulu kindly placed the quarantine buildings at our disposal. Assistant Surgeon W. W. Cress, of the *Alert*, rendered valuable assistance in the recovery and identification and was most assiduous in his labors. The illustrations furnished were taken by Hospital

Steward H. R. Jackson, who acted as official photographer for the board appointed by the Navy Department to investigate the cause of the accident.

The submarine was floated to the dock on the morning of August 31, where she lay nearly bottom side up, showing a large rent in the forward compartment, together with an almost complete demolition of the bulkhead connecting the forward and midship compartments. This rent was approximately 12 feet in diameter. Surgeon Curl entered and explored as far as he was able without the assistance of portable lights the middle compartment, failing to find any signs of human remains.

The interior of the vessel was a most complete wreck as to all its parts. The vessel's position on the dock (almost completely inverted) was identical with her position while she rested on the sea floor during the latter period of her submergence. This had rendered the battery plates still remaining in place very insecure and dangerous to those who were forced to work under them. The débris, consisting in most part of battery plates and separators to the number of several thousand, formed a pile several feet deep, all of which was subsequently cleared and carefully examined. The entire surface of the vessel and all its fittings, both inside and out, was coated with a slimy marine growth, while the effects of both acid and oil were plainly evident to the eye and nostril. The interior aspect of the vessel was indescribable, and the entire boat gave off a peculiar odor consisting of a combination of decaying marine life, human remains, and fuel oil. Owing to the ventilation near the rent the odor was not so overpowing in the middle compartment, but no work could be carried on in the engine room until an opening had been cut in the shell and a blower introduced and operated for several hours.

It was in the after compartment, or engine room, that most of the bodies or parts of bodies were found, only four having been recovered from the midship compartment and none from the forward.

About 8 a. m. of August 31 a shoe was seen above the débris near the forward bulkhead of the middle compartment, which investigation proved to be incasing the foot of what proved to be the remains of G. C. Ashcroft, gunner's mate, first class. Human remains continued o be found at intervals until September 9, when the submarine was eclared to be clear of human débris by the senior line officer directing he salvage work. No remains were found in the forward compartment, three were found in the middle compartment that were positively identified and one not susceptible of identification, while the fter compartment or engine room yielded 13 or parts of 13 bodies, nly one of which could be positively identified.

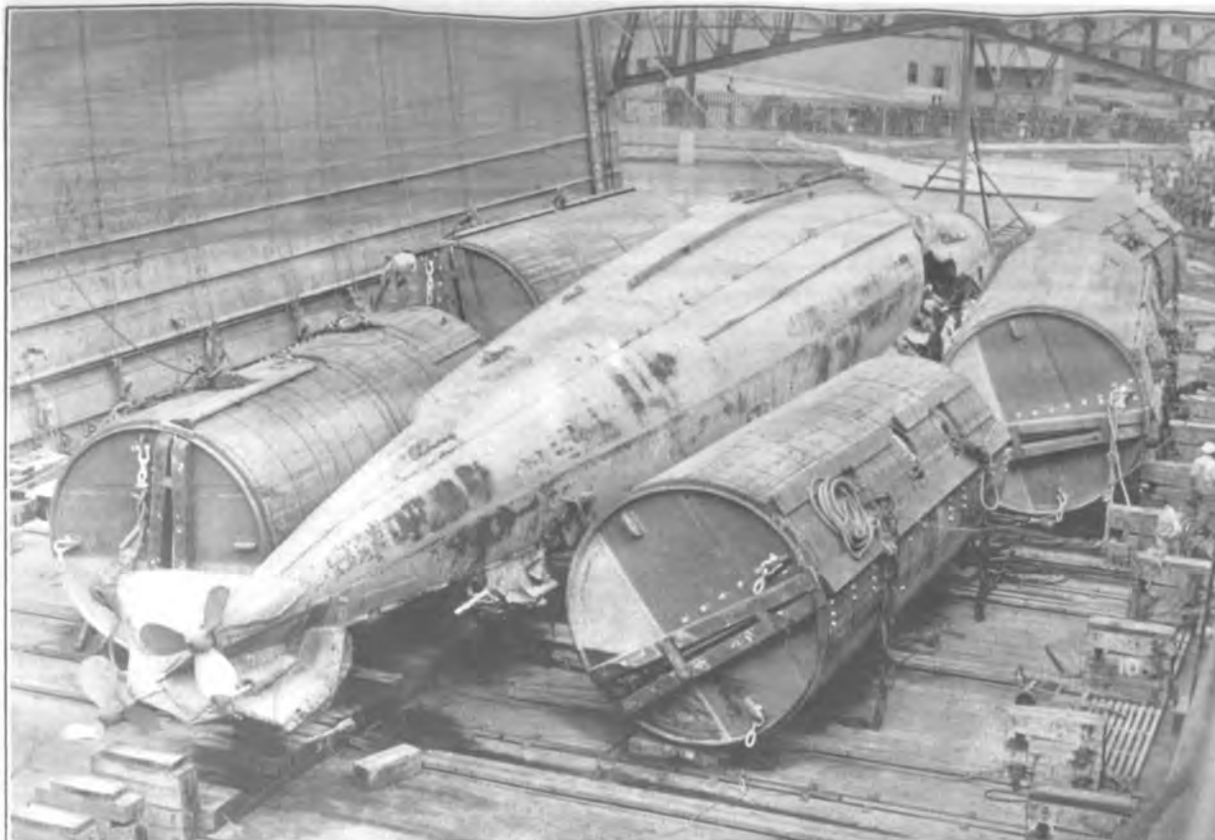
It is impossible to state with any accuracy, however, how many odies the incomplete and mutilated bones found toward the end of

the removal of the débris represented. For instance, a broken femur, some metacarpal bones, a few broken ribs, and incomplete fragments were regarded and listed as part of a body. These bones represented a collection found lying in apposition or nearly so. It is possible that these groups may have been mixed—quite possible that one bone found among others was all that remained of some individual. The large rent made it possible for bodies to be washed out. There were only six skulls found, indicating that parts of skeletons disappeared in that way. Whether entire bodies were swept out the recovery of the remains did not determine.

All stages of preservation and disintegration were encountered. Six skulls only were found, and all disarticulated and entirely denuded of tissue, except, as before mentioned, the tissues of the eye were converted into adipocere. These skulls were found in the middle compartment.

The inferior maxillæ were disarticulated in all instances. Of the six skulls recovered but one was in perfect condition, the others having suffered one or more fractures. The front teeth in all had been knocked out, except in one instance where extensive bridge work had been performed and which served to reenforce the structure. The long bones and ribs were, in most cases, fractured. Most of the damage to the bony structures was no doubt caused by the rough handling of the boat during the salvage operations, particularly during the rough weather, when the boat was no doubt turned completely over and repeatedly lifted and suddenly dropped to the floor of the sea, while the bodies were being constantly subjected to the attrition of the heavier objects in the interior of the vessel.

Mention has been made of the conversion of flesh into adipocere. In all of the three bodies recovered from the middle compartment that were subsequently identified the flesh adhering to the long bones had been converted into this fatty substance resembling adipocere. To this peculiar substance there was but little putrefactive odor. The fourth body recovered in this compartment consisted of but a few bones, sufficient only to establish it as parts of a fourth body. In two subjects removed from the engine room, where the flesh in other parts of the body was in an advanced stage of putrefaction and very offensive as to odor, the feet, covered by the shoes, were in an almost perfect state of preservation, the nails were in all cases intact, hair was still adherent, the skin intact and natural in color. At this point it might be apropos to mention the condition of the shoes, which in all cases were well preserved. Dungaree material in many cases showed a natural color and in some cases was still firm in texture, although in most cases this quality was lost. Many of the bones were separate and entirely denuded of flesh and blackened, suggesting, possibly, the



F-4 IN DRY DOCK, SHOWING THE LARGE RENT IN THE STRUCTURE.

LOOKING INTO MIDDLE COMPARTMENT THROUGH THE RENT IN THE HULL, SHOWING SOME OF THE BATTERY PLATES STILL IN PLACE.

VIEW OF MIDDLE COMPARTMENT LOOKING AFT FROM NEAR FORWARD BULKHEAD

ENGINE ROOM BULKHEAD VIEWED FROM NEAR CENTER OF MIDDLE COMPARTMENT

action of chemicals or fuel oil, probably the latter, as a brisk washing removed the discoloration. In several instances I recall, the contour of the buttocks could be noted. In two cases well preserved rectums were observed, each containing fecal matter of characteristic odor and appearance. In but few instances, however, could intestinal organs be identified. Portions of socks and underwear were found in advanced stages of disintegration but still adherent to portions of the bodies.

Identification of four bodies was positively made; that of Ashcroft, the first body recovered, by a bridge (lower) described in his health record.

Wells, C. H., machinist's mate, second class, was identified by a notebook containing many penciled notes, positively establishing his identity.

Herzog, F. N., electrician, second class, was identified by absence of molars noted in his health record and a large "H" cut in the heel of his shoe.

Mahan, I. L., machinist's mate, first class, recovered from the engine room, was identified by articles found in the pockets of the clothing still adherent to the body.

No further identification of bodies was possible. Mounds of bones were dug out with the débris of the engine room which were later separated into the parts of three or four bodies. In all of the skulls recovered, there was bridge work, crowns, and fillings not noted on the health records. Of the 21 health records examined, there was only one entry of bridge work and one gold crown. Two local dentists who had done much work for the submarine flotilla, were consulted with reference to the dental work noted in the recovered skulls, but the work could not be identified in any case with their office records. This dental work had probably been done on the west coast before the flotilla came to Honolulu. This lack of dental identification, which, on account of missing data, suggests the expediency of more care in noting dental work done among both officers and men, as several identifications could have been made had the characteristic dental operations been noted on the health records. It has been suggested that metal tags, light in weight—aluminum, for instance—be attached to officers and men, especially those doing submarine work, and worn about the neck. Experience in this accident teaches that if worn about the neck they would have been useless, as all the skulls were separated from the bodies; but that if worn about the ankle they would have remained. It would be well to insist on a regulation requiring that the heels of all shoes be marked with the initials of the owner cut into the leather.

The following procedures were carried out in handling the remains:

A lighter was secured to the end of the dry dock, screened from outside observation with canvas. This was outfitted with tables, autopsy instruments, and other paraphernalia necessary. The remains, as they were handed out of the vessel, were placed upon sheets of canvas and carried, when complete, to the lighter. They were placed upon the tables, and Dr. Cress and myself, with the assistance of the hospital corpsmen, carefully went over the remains, endeavoring to identify. Each bone was cleared of dirt and washed, and when the bones of the body were assembled after being denuded of flesh, the bones were placed in a gunny sack, tied, labeled (if identified or otherwise), and the sack and contents drenched with formaldehyde solution and placed in a large vat built in the middle of the lighter. The denuded flesh and débris was thrown in another sack, weighted with grate bars, which, when filled, was carried far out to sea and sunk.

After the remains had all been removed from the submarine, the lighter was towed to the quarantine dock, where the identified remains, the bones being carefully wrapped in cotton surrounded by oakum, were placed in caskets. The parts of the 13 unidentified bodies were divided and placed in four metallic caskets.

After the usual formalities with the Territorial board of health, death certificates having been secured, the caskets were transferred to the U. S. S. *Supply* for transportation to the United States.

U. S. NAVAL MEDICAL SCHOOL LABORATORIES.

Additions to the pathological collection, United States Naval Medical School, October–December, 1915.

Accession No.	Tissue.	Diagnosis.	Collected by or received from.
1123	Kidney	Cloudy swelling	Passed Asst. Surg. A. H. Robnett.
1124	do	Hypernephroma	Surg. A. M. Fauntleroy.
1125	Blood	Benign tertian malaria.	Passed Asst. Surg. P. R. Stalnaker.

Additions to the helminthological collection, United States Naval Medical School, October–December, 1915.

Accession No.	Parasite.	Host.	Collected by or received from.
19917	Ova: Ascaris, trichuris, ancylostoma, encysted amebas.		Passed Asst. Surg. M. E. Higgins.

NOTE.—In the October number of the U. S. Naval Medical Bulletin (vol. 9, No. 4), an error was made in recording the chicken as host for ascaris, trichuris, and hookworm under accession No. 19916. A collection of intestinal parasites from the chicken was received at the time the entry was made, but the identification of these parasites has not as yet been taken up.

SUGGESTED DEVICES.

A SIMPLE TEST OF STERILIZER EFFICIENCY.

By E. THOMPSON, Surgeon, United States Navy.

When articles are subjected to heat in a sterilizer the process is not complete until the material in the center of the cage has been subjected to the proper temperature for a proper length of time. This is of course self evident, but the decision as to the moment when sterilization is complete is a matter of personal judgment, derived from consideration of pressure-gage readings, time, and perfection of technic. Exposure to moist heat at 15 pounds pressure for one-half hour will render surgical material aseptic if it is certain that the innermost package has been subjected to the heat of 121° C., which is the equivalent of a pressure of 15 pounds. A number of devices have been brought forward to be used as checks on the efficiency of sterilization. A prominent one consists of small tubes of wax and gums in combinations that have been found to melt or change character at specific degrees of heat. These have some considerable latitude in their registering and must be purchased and kept in stock.

In a description of the English hospital ship *Drina*, by Staff Surgeon R. J. Willan, R. N. V. R., a very simple and attractive sterilizer test is mentioned. It is, however, "made in Germany," and credit is given to the clinic of Prof. Garre, at Bonn. (Jour. Roy. Nav. Med. Service, Oct., 1915.)

The test hangs on the decolorization of iodid of starch at a high temperature. The best formula of the iodid of starch is as follows:

Starch	ounces	1.0
Iodin	grains	7.0
Potass. iodid	do	7.0
Water, to make oz.		10.0

The starch is boiled in half the water. The boiling is stopped when the mixture strikes a smooth paste. The iodin and potassium iodid are dissolved in the remaining water. The two are mixed, forming the usual blue-black paste. Then pieces of white paper are heavily marked with a soft lead-pencil, and the starch-iodin paste is smeared on until the lines on the paper are just obliterated. For convenience the word "sterile" may be written or printed on the paper. Figure 1 shows the appearance of the paper prepared for the test. The paper is wrapped in a large towel, which is packed as near the center of the

sterilizer chamber as possible. When the sterilization is presumed to be complete and the contents of the chamber are removed the test paper will speak for itself in a surprising manner, as is shown in figure 2, which was recovered after having been exposed to 15 pounds pressure for one-half hour in a new and accurate "American" sterilizer. This test appeared so positive and simple that further experiments were made at lower temperatures and shorter periods of time. The results seemed to indicate that it really was necessary to expose the prepared paper one-half hour at 15 pounds to get complete decolorization. For example figure 3 was exposed only one-quarter hour at 15 pounds. It can be seen that there is still some color left. Figure 4 was exposed for one-quarter hour at a lower pressure (10 pounds). If it runs true to the rule it should have more color than figure 3. It does indeed and this fact demonstrates that the test is quite sensitive. Figure 5 was exposed for one-half hour at 10 pounds. There is still some color left. The decolorization of the paper has been explained by the simple statement that the iodin is vaporized, leaving the transparent starch. The point at which iodin rapidly vaporizes is 115° C. or about 10 pounds pressure. For various reasons this may not be the true explanation and the problem may be more of a chemical one. At certain heats the papers change to various colors in which brown predominates. Figure 4 is dark bluish-brown; figure 3 is light brown, and figure 5 is very light reddish-brown. The amount of iodin on one paper is so small that it is difficult to believe that the change is produced by driving off this minute amount of the element. I have roughly estimated that the amount of iodin on each paper is near one-hundredth of a grain. This amount should easily and quickly vaporize by almost any heat.

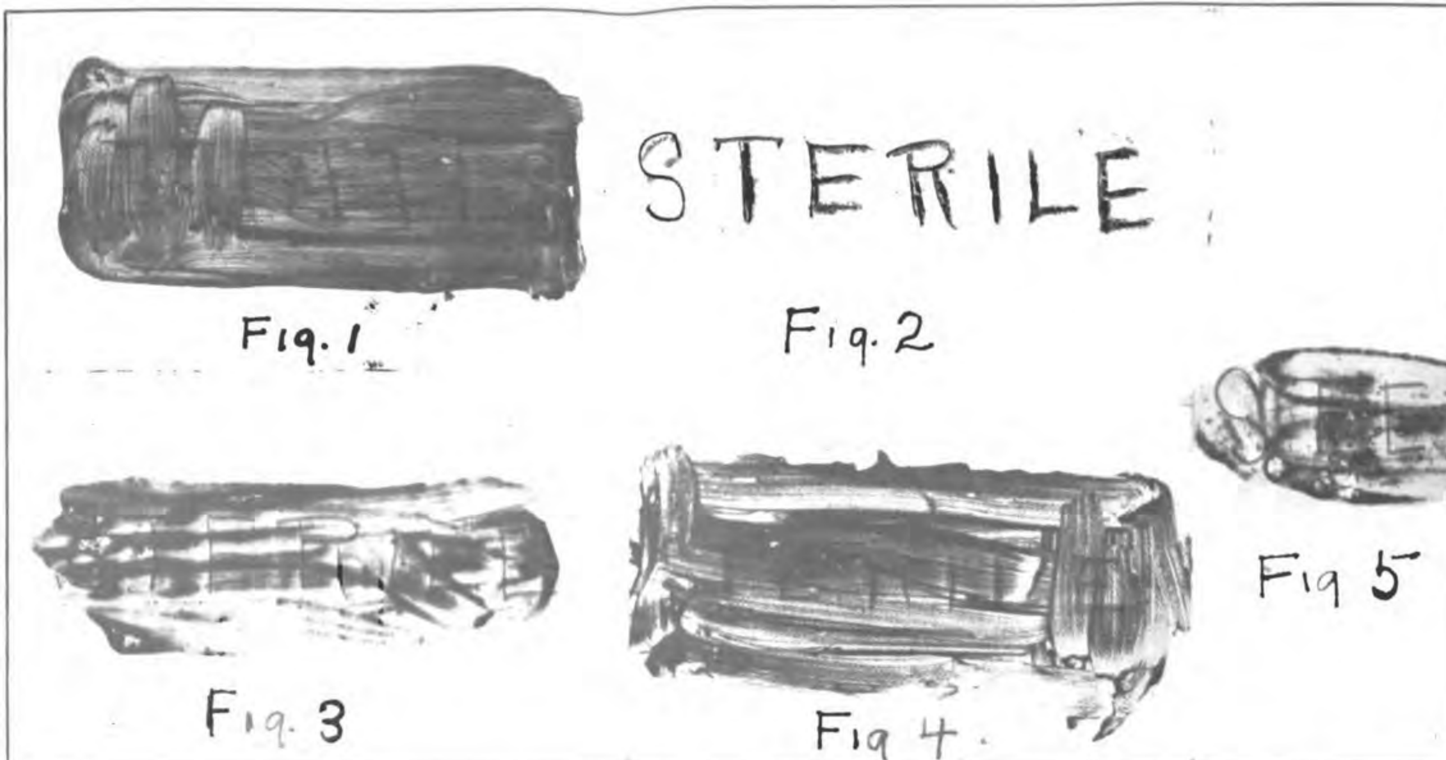
The explanation may be associated with the chemistry of starch, especially in its reaction to heat. The hydrolysis of starch goes through various forms. When first heated it becomes a soluble amylodextrin. This gives the blue reaction with iodin. With heat the conversion is continued through malto-dextrin and erythro-dextrin, which strike brown and red color reactions with iodin. Erythro-dextrin changes into achroö-dextrin, which gives no color with iodin.

This test seems accurate in spite of its crudeness and should become absolutely trustworthy when properly refined by using measured amounts of paste, etc.

A HANDY ELECTRICAL APPLIANCE FOR THE SICK BAY.

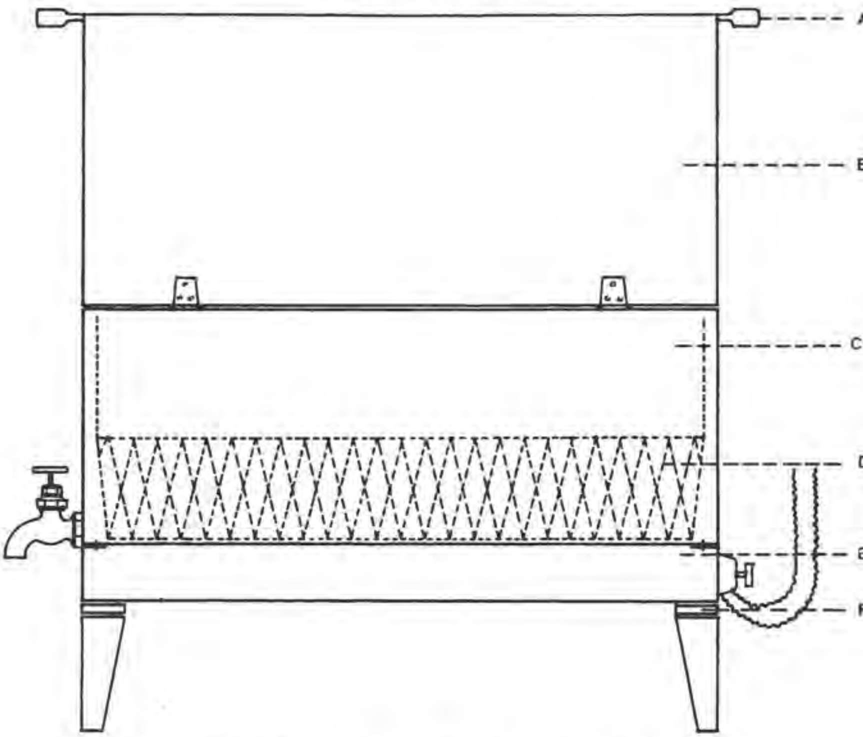
By A. Farenholt, Surgeon, United States Navy.

The advisability of having in the medical department a ready means for the sterilization of instruments, the frequent and often hurried need for hot water, and the utility of a general heating unit,



For description see text.

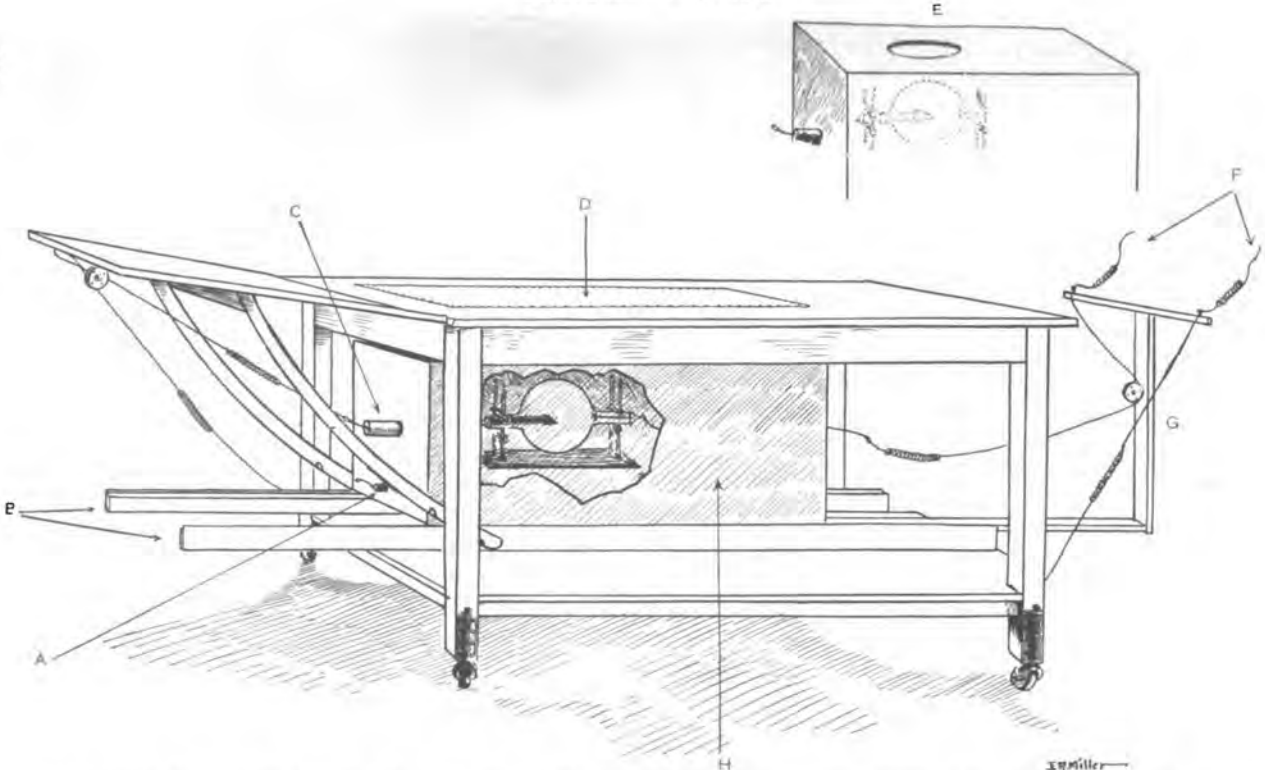
Farenholt—Improvised Sterilizer.



A, Fiber handles; B, top; C, water chamber; D, instrument tray; E, electrical chamber; F, asbestos pads.

100–2

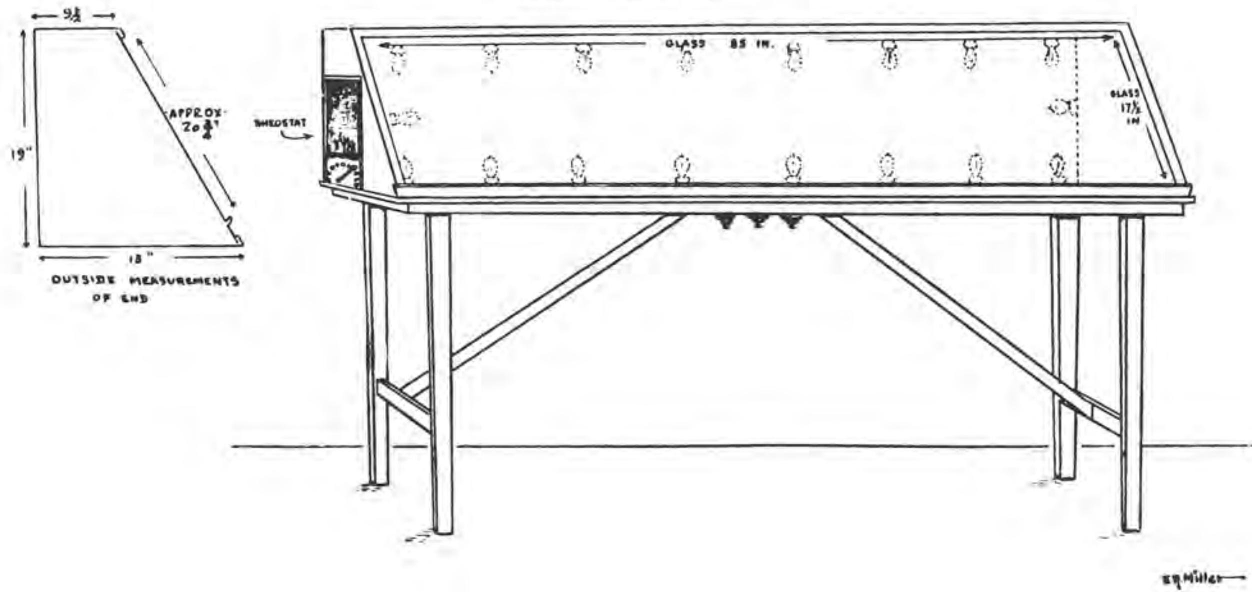
Gall—Horizontal Fluoroscope.



A, Spark gap for regulating device; B, track for box; C, hard rubber insulating post; D, 4 mm. aluminum plate (14" x 30"); E, top of lead-covered box; F, to transformer; G, traveling carrier for feed wires; H, lead-covered box.

100-1

Gall—Illuminating Box.



For description see text.

has suggested the plan for a combined small sterilizer and water heater actuated by electricity.

Such an appliance has been easily made by the coppersmith and the electrical department of this vessel, the *Oregon*, and has been found to be of great practical value. The dimensions may be as desired; in this case they are length 11 inches, sufficient to accommodate a sound, width 5, and depth 4 inches, having a capacity of 2 quarts. The material may be either of copper or of brass, well tinned on the inside. On one end, and at the lowest possible point, a water cock, preferably with fiber handle, is placed to facilitate the drawing of water. The lid should be hinged, snugly fitted, have a chain back check and fiber handles on each front corner.

The electrical element should be contained in a compartment about an inch in depth, without top, to facilitate the transmission of heat, made of the same material and of the same lateral dimensions as of the water chamber, and secured to the bottom of it by solder or small bolts.

The electrical current enters from a switch soldered to the end opposite the water cock. Four legs insulated by asbestos strips permit a sufficient air space below. A special and suitable thermometer may be purchased and fitted as a permanent addition to the front side. Two heats may be obtained by double-winding.

The tray for instruments may be made from various styles of wire mesh, galvanized; an excellent one may be improvised from a wire desk letter basket, also galvanized. Sterilization may be accomplished by the use of less than one pint of water. The time necessary to raise water from 60° F. to the boiling point, using No. 22 nichrome wire, wound to use about 10 amperes current, is as follows:

	Minutes.
One pint	10
One quart	18
Two quarts	35

Beside the numerous but rather expensive sterilizers on the market there are many patterns and varieties of electric stoves, disc heaters, and immersion coils which may be very handily used in the sick bay.

DESCRIPTION OF A HORIZONTAL FLUOROSCOPE AND AN ILLUMINATING BOX MADE IN A NAVAL HOSPITAL.

By H. L. GALL, Hospital Steward, United States Navy.

HORIZONTAL FLUOROSCOPE.

As a sequel to the rapid advancement made in the perfecting of X-ray apparatus many pieces are being discarded after only a few years of usefulness. This has meant a big outlay to the operator who has tried to keep abreast of the times. Very often these discarded

pieces can be converted into useful and practical pieces of apparatus with the outlay of a small amount of money. The accompanying illustration is an example of this; it represents the conversion of an X-ray table into a horizontal fluoroscope.

The table here in question is a Scheidel-Western which was discarded at the United States Naval Hospital, Washington, D. C. A rectangular hole (12 by 28 inches) has been made in the top and covered with a 4 mm. sheet of aluminum (14 by 30 inches). Two grooved tracks (wood) for carrying the tube box have been fastened to the under shelf of the table and extended far enough out under the head of the table to permit the box to reach the upper part or head of the table and to insure the easy handling of the box in changing tubes or in doing any other work within the box. The exact size of the tube box is not essential, other than that its dimensions be in proportion to the space allotted it, and that it admit the tube easily. It is made of wood, top removable and covered with sheet lead, and aperture in top about 4½ inches in diameter. The brackets for holding the tube are made of wood and similar in construction to those found on any ordinary tube stand. Hard rubber terminal insulating posts at either end of the box are 6 inches long by 2 inches in diameter. The insulating post for passage of the wire from the regulating device of the tube is hard rubber 3 inches long by 1 inch in diameter. This spark gap is placed outside of the box for the sake of convenience only. In using the Coolidge tube this post is not necessary. The traveling carrier for the feed wires is made of wood and so connected to the table that it can be depressed against the table or extended to such a distance from the table as to make contact with the patient's feet impossible.

For other details of construction it is believed that the illustration is self-explanatory.

The above type of table is very simple in construction and could be readily made at any naval hospital. The conversion as noted in this article can be applied to almost any table found in our hospitals for the small outlay of about $7, or a complete new table along the same lines can be constructed for about $15. This cost does not include labor.

ILLUMINATING BOX.

For examination of X-ray plates the hospital has for the past two years used an illumination bank sufficiently large to permit of comparison of several plates. One large bank may be made by the carpenter, as shown in the illustration, or a double bank if there is a question of space concerned. In addition to the features shown in the illustration it might be desirable to include three or more dark shades for screening the parts of the illumination bank not in use.

CLINICAL NOTES.

CREEPING ERUPTION. REPORT OF A CASE.

By J. C. PARHAM, Passed Assistant Surgeon, United States Navy.

The etiologic factor causing the condition variously known as creeping eruption, larva migrans, and dermamyiasis linearis migrans oestrosa is ascribed to the larva of an undetermined fly. Stelwagon, quoting Sokolow, states that the parasite resembles the larva of a fly, is 1 mm. in length, with 10 segments and hooklets, and at the head end two suckers. Sokolow considered it the larva of a botfly or oestrus of the genus Gastrophilus and probably of the species *hemorrhoidal.*

The condition is not rare in some parts of Europe, Asia, Africa, and Central and South America, but as yet few cases have been reported from North America, according to the literature available. For this reason the cases occurring in this vicinity, two of which came under my observation, are interesting.

Stelwagon reports that in his four cases, as in some of the cases reported by others, the infection began during or after a visit to the seashore. The district from which the following cases came is on the Cooper River in the neighborhood of the navy yard, South Carolina, approximately 10 miles from the sea.

D—, quarterman paver. Residence, North Charleston. August 20, 1915. Had been in bushes and salt water marshes all day. That night he noticed lesion on right leg over shin, very red and about the size of a 25-cent piece, considerable itching.

On August 23, or three days later, the lesion began to extend downward as a line one-sixth inch wide and slightly elevated, at the rate of one-half inch per day. Tr. iodin locally failed to retard progress. On the 28th of the month patient presented himself at the dispensary.

At this time the lesion was a well-defined red line, elevated about one-twelfth inch, and progressing from one-half to 1½ inches daily. The eruption showed a large number of irregularly disposed vesicles varying from the size of a pin point to a pinhead, surmounting it. There was no pain but considerable discomfort on account of the itching. It had faded almost entirely at its point of origin and for several inches therefrom, the fading diminishing as the more recent portion of the eruption was approached.

The active end of the lesion gradually tapered off into an area the size of a 50-cent piece, which was indurated and presented the usual signs of inflammation. As the eruption traversed this area it lost its aspect of inflammation, to continue just in advance of the line. The tissue for one-fourth inch on either side of the eruption showed slight inflammation, but the skin outside of this narrow zone retained its normal appearance and thus helped by contrast to make a very sharp and striking picture.

Repeated search failed to demonstrate the larva.

The diagnosis of the condition is made at a glance. The sharply defined linear eruption progressing with, against, or across generally established lines of blood and lymph flow is characteristic, and at once suggests the infection and the character of the infecting agent.

The accompanying plate illustrates the condition very truthfully. The dark, elevated area at the upper and active end of the lesion resulted from the intradermic injection of chloroform in advance of the eruption and its course as prognosticated at the time of injection. It will be seen that the larva turned and went around the eruption; it acted similarly two days previously, when an intradermic injection of a solution of phenol was given. A second more extensive injection of chloroform cured the lesion.

Through the kindness of Dr. W. Atmar Smith, of Charleston, I was permitted to see a second case of creeping eruption in the person of a boy, an employee of the yard, living just outside the navy yard. He showed three separate and distinct lesions. He informed me that on July 5, 1915, he camped for one day in North Charleston by a spring under a large oak tree, and that three days later the eruption broke out. He also stated that of the seven boys in the party three developed the same eruption.

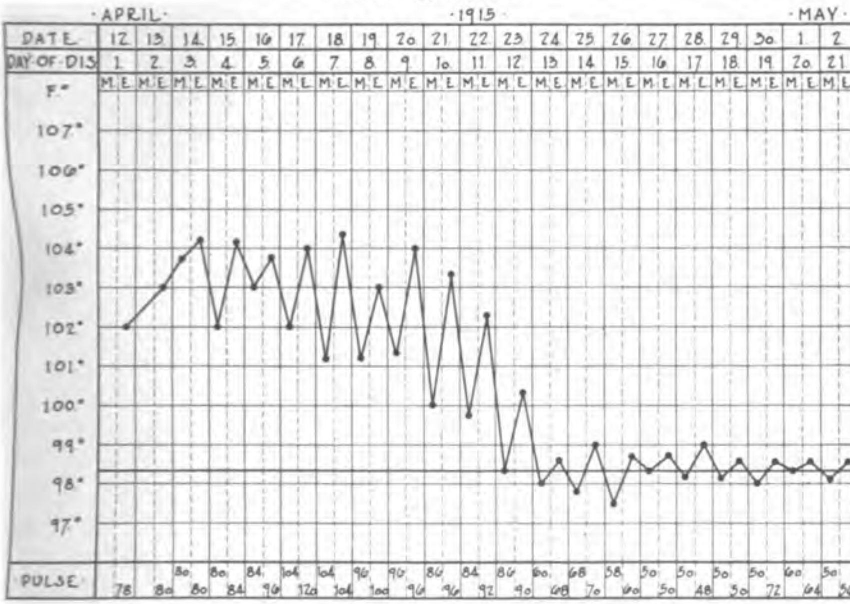
A SPORADIC CASE OF TYPHUS FEVER.

By R. G. Davis, Passed Assistant Surgeon, United States Navy.

At this time when various cases of typhus fever are being reported showing the temperature to have terminated by lysis instead of crisis, as classical texts record, the accompanying chart will be of interest illustrating a sporadic case occurring aboard ship while lying in the port of Shanghai.

The case was typical as to symptoms, rash, and duration of temperature. It will be noted the pulse did not reach 101 until the sixth day, in spite of the temperature being 104.2°. Cold sponges and packs had only temporary effect on the temperature and the severe headache could only be relieved by hot packs. The mind remained

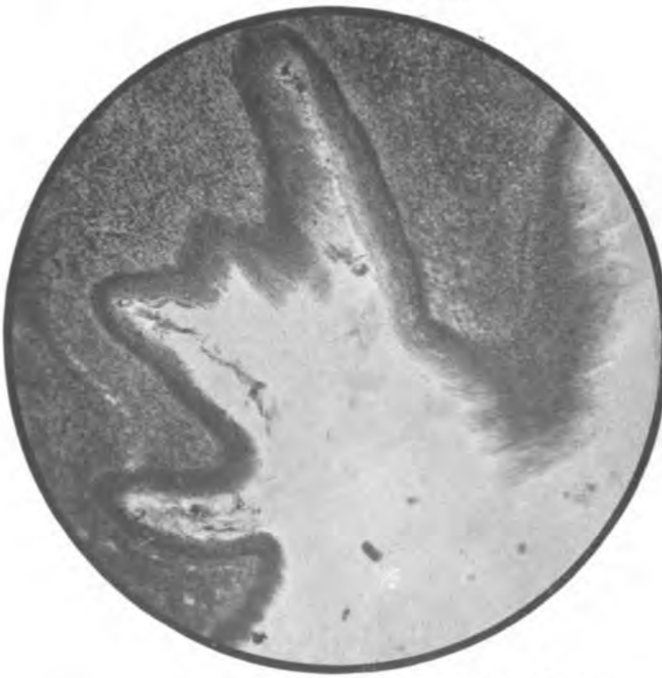
Davis—Typhus Fever.



Parham—Creeping Eruption.

The dark elevated area at the right resulted from the intradermic injection of chloroform in advance of the eruption. It will be seen that the larvæ turned and went around this area.

Johnson—Branchiogenic Cyst.



H. L. Gall and E. R. Miller.

SECTION OF BRANCHIAL CYST.

Shows epithelial lining of squamous type with underlying diffuse lymphoid tissue. (Zeiss: 16 mm. Objective. No. 4 Ocular.) (E. R. S.)

clear until the sixth day, when delusions of grandeur appeared which remained for four days after the temperature became normal. The pulse became slower than normal, but no changes occurred in the heart muscle as far as percussion and auscultation could elicit. The case made a complete recovery. No body lice could be found and no other cases occurred aboard ship or were present ashore.

A BRANCHIOGENIC CYST.

By L. W. Johnson, Passed Assistant Surgeon, United States Navy.

The term "branchial cyst" has been applied improperly to all cysts of the branchial region, whether or not of branchial origin. Warthin[1] therefore uses the term "branchiogenic cyst" for those of true branchial origin, thus indicating both their origin and their structure.

Four branchial clefts and five arches appear about the fourth week of fetal life; these never perform any respiratory function, as do their analogues, which go to form the gill slits of the fishes. The first cleft normally develops into the eustachian tube; the lower portion of the second becomes the tonsillar fossa; the third persists as the sinus pyriformis of the larynx, and portions of the thymus and thyroid represent the fourth. Corresponding to each groove in the entoderm is one in the ectoderm, only a thin wall of mesoderm separating them. Various malformations may occur, the more common ones being fistulas, which may have internal or external openings, or both; cysts, either of the entoderm or ectoderm; diverticula and accessory thyroids.

Branchial cysts vary according to their origin, whether of the ectoderm or entoderm. If arising from the entoderm, the lining membrane will resemble the mucous membrane of the larynx in structure and the contents will be mucous fluid; if arising from the ectoderm, the lining will resemble the skin and the contents will be sebaceous. In the case to be described, the lining membrane was composed of modified squamous epithelium and the contents were sebaceous matter and desquamated epithelium. This is the more common type.

Most writers agree that the prospects for cure of a branchiogenic cyst or fistula without operation are very slight, and that the prognosis in cases that are operated depends on the ability of the surgeon and the difficulties presented by the individual case. Even the most skillful surgeon may fail to effect a cure in some cases. Nothing short of absolutely complete extirpation will afford complete relief. The branchiogenic cyst is rarely diagnosed clinically, the majority being

1 Warthin, Reference Handbook of the Medical Sciences, 3d edition, vol. 2, p. 442.

16215—15——8

considered tuberculosis of a cervical lymph node, and the correct diagnosis being made only on operation or microscopic examination of the tissue. The chief points in the diagnosis are the location; the slow growth of a soft, cystic tumor not preceded by a solid tumor; the contents removed by aspiration. A fistula with an external opening will cause less difficulty in diagnosis than a cyst, but if it opens only internally, diagnosis may be difficult or impossible.

The following case was observed at the naval hospital, Guam:

A private marine was admitted with the diagnosis of cystoma (branchiogenic cyst). A small swelling at the left angle of the jaw had been noticed since infancy, and during the preceding six months, possibly due to irritation from the high collar of the uniform coat, had rapidly increased in size. At the time of admission there was a superficial, fluctuating, painless tumor filling the entire submaxillary triangle and extending posteriorly to the anterior border of the trapezius. There was no evidence of suppuration or inflammation. A portion of the contents was aspirated and found to be a thick, odorless, buff-colored fluid containing degenerated epithelium, leukocytes, and sebaceous matter.

The operation was performed by Surgeon J. L. Neilson, United States Navy. By careful dissection it was possible to remove the entire sac without rupturing it. The main mass lay beneath the platysma myoides and anterior to the large vessels of the neck; from the deepest portion of the sac a fibrous cord extended to the pharyngeal wall. The cyst contained about 350 c. c. of fluid, and several masses of the consistency of cartilage were closely adherent to the wall. A small drain was left in the lower angle of the wound for 24 hours and then removed. Healing was rapid and there has been no recurrence during the five months since operation.

BILATERAL THROMBOSIS OF CENTRAL RETINAL VEINS.

By S. WALKER, Jr., Assistant Surgeon, Medical Reserve Corps, United States Navy.

The following case is interesting from two standpoints; the first is that of the eye findings, the second is the brain lesion. The former will be discussed first and in more detail.

The patient, a Polish woodworker, stated that he had retired one night four days previous to my examination, and that on awakening the following morning found that he was almost totally blind. According to his statement the only trouble he had had previously was a diplopia, beginning about four months before. On close inquiry into his personal and family history he stated that he never had any venereal disease, that he had had a few slight attacks of rheumatism, and was the father of four children, two of which were feebleminded.

EXAMINATION.—Shows a well-nourished man who appears to have some difficulty with his speech and yawns at times.

Head: No deformities; ears, nose, and throat negative.

Neck: Negative.

Chest: Few bronchial râles at upper portion.

Heart: Within normal bounds, tones are weak and slightly irregular, but no murmurs are present.

Arteries: Slight amount of thickening present, blood pressure 180 (Faught).

Abdomen: Liver slightly enlarged, otherwise negative.

Genito-urinary system.—Urine: Some albumin, but no casts; quite a few bacteria.

Extremities: No edema present. Reflexes: Babinski present at times; knee jerks accentuated; Chadwick present at times; ankle clonus present; patient drags right foot some when walking and shows some ataxia.

Blood: Both white blood count and red blood count are normal; differential smear normal; Wassermann negative.

Spinal fluid: Under pressure 180 drops per minute. Clear macroscopically, but when centrifuged few red blood cells present in the sediment. Wassermann negative.

Eyes: Vision at first, fingers 10 feet; vision one month later, fingers 6 feet; no external lesion present; slight amount of conjunctivitis present.

Muscles: Inability to use recti (superior and inferior), obliques (superior and inferior). External and internal recti apparently all right, except squint present at times.

Iris: At first did not react to the strongest light, but later reacted sluggishly. Otherwise normal.

Anterior chamber: Normal in size and clear; tension normal (fingers).

Opthalmoscopic examination: When first seen there were large hemorrhages throughout the retina with some exudate, especially about the disk. Later examination showed these areas to be absorbing and also a portion of the exudate. Vitreous clear and no opacities present. Vessels: Veins greatly enlarged and tortuous. Blood column quite dark at parts, and there is no emptying on pressure over globe. Arteries small, light colored, and buried in hemorrhage at first but visible later on. Disk was difficult to see at any time on account of the large amount of exudate, but there was no swelling present at any time the eye was examined.

From the above clinical findings we have the rather rare condition of bilateral thrombosis of the central retinal veins.

This diagnosis was made on the history, etiologic factors, the atheromatous vessels, edema of the ventricles due to brain tumor giv-

ing rise to pressure on the veins, the myocarditis and the opthalmoscopic examination. This case must be differentiated from two or three other conditions which simulate it closely at times and of which only the excluding factors will be named.

Papillitis: History negative; no swelling present at any time, and there must be some swelling of the nerve head to be papillitis according to the majority of authors. The opthalmoscopic picture of the remainder of the fundus bears some resemblance. Thrombosis may result from stagnation of the blood current and from changes in the vessel walls. In papillitis both these conditions may be present and it is possible that in some cases of papillitis in which the retinal veins are much distended and hemorrhages numerous that there is actually coagulation in the cerebral vein. But it is equally certain that thrombosis may occur without antecedent papillitis.

Embolism of the central artery: Only discussed because Gonin in 1913 in the Arch d'Ophth., Paris, reports some few cases that were clinically thrombosis and pathologically embolism of the central artery. However, both the history and the opthalmoscopic picture in this case are different.

Hemorrhagic neuro-retinitis: History negative; kidney and heart condition not of the type to cause it; other etiologic factors more prominent.

Brain condition: Probably a brain tumor, the type of which I will not venture to state and only suggest the possibility of glioma or hemorrhage. Whatever the mass is, it is of slow growth. Location in all probability is just back of the corpora quadrigemina.

It is greatly to be regretted that this case did not come to postmortem examination. In this I tried and failed.

INTERNAL HERNIA. REPORT OF CASE.

By W. C. Espach, Assistant Surgeon, United States Navy

Clinical report in the case of G—, male, white, age 29.

On October 1, 1915, at 6 a. m., patient reported at sick bay complaining of soreness all over the abdomen, following the use of heavy pulling weights on the afternoon of September 29. On admission the temperature was 97° F., pulse 92, respiration 21. By 8 a. m. temperature was 98° F., pulse 78, respiration 20, with vomiting of gastric contents. The patient had been a boxer in the fleet for four or five years, and upon questioning him it was learned that a few years previously he had experienced a similar attack following intensive training, at which time he was in bed for three or four days. On October 2 temperature ran between 98° and 99° F., pulse 70, respiration 20, vomiting lessened, slight result from enema, and general im-

provement noted. October 3 temperature 98° to 99° F., pulse 102, albumin in urine, vomiting lessened, seemed to be resting easier, much of the abdominal pain having disappeared.

October 4, 8 a. m., temperature 99.2° F., pulse 106, albumin in urine, vomiting lessened, leukocytosis of 35,000; patient seemed about the same as on previous day. By noon temperature 100° F., pulse 118, but fair quality. At this time an anxious expression was noticed on face, and the abdominal pain, while much less than on the day of admission, was more localized in right iliac region. An exploratory operation was decided upon. At 4 p. m. patient was put on table, ether given. When abdomen was opened an extremely foul-smelling exudate drained out; upon further examination the last 30 inches of ileum were found to be gangrenous. This condition was caused by the gut being forced through a tear in the mesentery, which acted as a constricting band. In addition the mesentery of the strangulated portion was twisted upon itself in such a manner as to shut off the blood supply of the gut. The gangrenous portion was excised, and the cut end of the ileum anastomosed with the cecum. During the latter part of the operation the patient was in a very poor condition, pulse extremely rapid and weak, hypodermoclysis being resorted to before patient was taken from the operating room. At 8 p. m. 500 c. c. saline was given intravenously, but the patient weakened rapidly and at 9.30 p. m. died. Autopsy the next morning showed the suture line of anastomosis to be firm and tight, with no hemorrhage in abdominal cavity.

The reason for reporting this case is because of the serious condition existing, and general obscurity of the symptoms. It bears out Da Costa's assertion: "An internal hernia is not thought of until strangulation takes place, and seldom then."

REPORT OF A CASE OF PSORIASIS LIMITED ALMOST EXCLUSIVELY TO THE SCALP.

By J. H. Harris, Acting Assistant Surgeon, United States Navy.

On October 11, 1915, K—, of West Ronall, Me., age 23 years, applicant for enlistment, presented himself before me for the physical examination. As the applicant, entirely nude, stood before me in a bright light and presented successively the front, rear, and sides of his body, a few poorly defined lesions were observed on the extensor surfaces of the elbow. Upon closer inspection lesions of the same type, but more marked in character, were discovered involving the back of the neck and running up over the scalp.

The lesions varied in size from a pinhead to a dime, were poorly defined against a sound skin upon the extensor surfaces of the elbow,

were sharply defined on the scalp, were more or less infiltrated, slightly elevated, and more or less abundantly covered with mother-of-pearl colored scales.

There was no systemic disturbance, heart was normal, lungs were clear and resonant throughout, and temperature and pulse were normal. Applicant stated that itching had not proved a troublesome symptoms, although infrequently a variable amount of itching is present in cases of psoriasis.

In reply to my inquiry as to the duration of the condition, the applicant stated that the lesions had been present for the past nine years, that they became less active and sometimes disappeared altogether during the warm summer months, but invariably reappeared upon the advent of winter.

Upon the duration of the disease, combined with the predilection of the lesions for the extensor surfaces of the elbows, the absence of itching, the variously sized infiltrated scaly patches, and the chronic sluggish course, the diagnosis of psoriasis was made.

In order to study the condition more closely and to observe the effects of treatment Fowler's solution, minims 6, t. i. d., was prescribed, and the applicant told to report again at the recruiting station at the expiration of 10 days. In the meantime the Bureau of Medicine and Surgery was consulted in regard to the enlistment of the applicant.

Psoriasis, although a rather common disease and met with in all walks of life, is, as far as my experience goes, a rare condition among applicants for enlistment, this being the first and only case seen so far among 350 applicants examined for the service.

This case proved rather difficult to diagnose from the lesions alone, without the aid of any history, as the lesions were not typical, being in the transition period between the warm summer months when there is a natural tendency for the disease to become less active or to disappear altogether, and the cold winter months when the lesions reappear.

SUMMARY.—1. Psoriasis is a chronic, inflammatory disease, characterized by dry, reddish, variously sized, rounded, sharply defined, more or less infiltrated, scaly patches.

2. The condition usually first makes its appearance between the ages of 15 and 30. It is rarely seen before the tenth year, and a first attack is uncommon after the age of 40.

3. Psoriasis has a predilection for the following special parts: The extensor surfaces of the limbs, especially the elbows and knees, are favored localities, and even when the eruption is more or less general these regions are usually most conspicuously involved. The face often escapes, and the palm and soles, likewise the nails, are rarely

involved. In exceptional instances the eruption is limited almost exclusively to the scalp (as in the case above discussed).

4. There is no systemic disturbance, but a variable amount of itching may be present, although, as a rule, it is not a troublesome symptom.

5. *The clinical appearances of a typical well-developed case.*—Twenty or a hundred or more lesions, varying in size from a pinhead to a silver dollar, are usually present. They are sharply defined against the sound skin, are reddish, slightly elevated and infiltrated, and more or less abundantly covered with whitish, grayish, or mother-of-pearl scales. The patches are usually scattered over the general surface, but are frequently more numerous on the extensor surfaces of the arms and legs, especially about the elbows and knees. Several close-lying lesions may coalesce and a large, irregular patch be formed; some of the patches, also, may be more or less circinate, the central position having in a measure or completely disappeared.

6. *Development and history of a single lesion.*—Every single patch of psoriasis begins as a pin point or pinhead sized, hyperemic, scaly, slightly elevated lesion; it increases gradually, and in the course of several days or weeks usually reaches the size of a dime or larger and then may remain stationary, or involution begins to take place, usually by a disappearance, partially or completely, of the central portion, and finally of the whole patch.

7. The eruption of psoriasis is always dry in character.

8. *Course.*—This, as a rule, is eminently chronic, patches may remain indefinitely, or may gradually disappear and new lesions appear elsewhere, and so the disease may continue for months and sometimes for years; or after continuing for a longer or shorter period may subside and the skin remain free for several months and sometimes for years; or after continuing for a longer or shorter period, may subside and the skin remain clear for several months or one or two years, and in rare instances may never return. The course of psoriasis is influenced by the seasons; there is a natural tendency for the disease to become less active or to disappear altogether during the warm months.

9. *Etiology.*—The causes of the disease are always more or less obscure. There is often an hereditary tendency, and the gouty and rheumatic diatheses must occasionally be considered potential. In some instances it is apparently influenced by the state of the general health. It is a rather common disease and is met with in all walks of life.

10. Psoriasis is not contagious. In recent years the facts of its exhibiting a family tendency has been thought as much suggestive of contagiousness as heredity.

11. *Pathology.*—According to modern investigations it is an inflammation induced by hyperplasia of rete mucosum; and it is begin-

ning to be believed that this hyperplasia may have a parasitic factor as the starting cause.

12. Psoriasis is most likely to be confounded with squamous eczema and the papulo-squamous syphiloderm, and on the scalp with seborrhea. It can scarcely be confounded with ringworm.

13. *Progress.*—This is usually favorable so far as concerns the immediate eruption, but as to recurrences nothing positive can be stated. In rare instances, however, the cure remains permanent.

14. *Treatment.*—Both constitutional and local remedies are demanded in most cases. Dietary measures as a rule exert no influence, but the food should be plain, and an excess of meat avoided. The important constitutional remedies usually employed follow:

(*a*) Arsenic is of first importance. It is not suitable in acute or markedly inflammatory types; but it is most useful in the sluggish, chronic forms of the disease. The dose should never be pushed beyond slight physiological action. It may be given as arsenious acid in pill form, one-fiftieth to one-tenth of a grain three times a day, or as Fowler's solution, 3 to 10 minims as a dose.

(*b*) Alkalies, of which liquor potassæ is the most eligible. It is to be given in 10 to 20 minim doses, largely diluted. It is valuable in robust, plethoric, rheumatic, or gouty individuals with psoriasis of an acute or markedly inflammatory form. It is not to be given to debilitated or anemic subjects.

(*c*) Salicin, sodium salicylate, and salophen in moderately full doses act well in some cases. Occasionally thyroid preparations have a good effect.

(*d*) Potassium iodid, in doses of 30 to 100 grains, t. i. d., acts favorably in some instances; there are no special indications pointing toward its selection, unless it be the existence of a gouty or rheumatic diathesis.

(*e*) Tar is, all things considered, the most important external remedy. It is comparatively slow in its action, but is useful in almost all cases. As employed usually it is prescribed in ointment form, as the official tar ointment.

(*f*) Ammoniated mercury is applied in ointment form, 20 to 60 grains to the ounce. Compared to other remedies it is clean and free from staining, although as a rule not so uniformly efficacious. It is especially useful for application to the scalp and exposed parts. It should not be used over extensive surface for fear of absorption.

On October 31, 1915, the Bureau of Medicine and Surgery, in view of the history of this case, did not consider the enlistment of this applicant desirable. Consequently the medical officers at recruiting stations may find a perusal of this case instructive from the standpoint of rejecting applicants who present chronic, sluggish cases of psoriasis with a history of several years' duration.

EDITORIAL COMMENT.

PROGRESS OF THE WAR.

The magnitude of the present world-conflict renders a proper conception of the development of and contributions to medico-military science a matter for a later decade. We can not afford, however, to wait for that period; we must keep abreast of conditions as they appear, in so far as our facilities allow.

The following résumé endeavors to present fairly correctly some of the phases that are most worthy of attention from the naval medical officer's viewpoint.

TRANSPORTATION OF THE WOUNDED.

(*a*) *Hospital and ambulance ships.*—At the outbreak of hostilities none of the contending nations were equipped sufficiently with vessels for care or transportation of the sick and wounded to provide for even a moiety of their needs. Great Britain had two, Austria three, Japan two, the others none. The first and most urgent call for additional facilities came from the thousands of wounded, soon tens of thousands, pouring back from the battle front in France, demanding trans-channel transportation to the larger base hospitals in England. For this purpose speedily converted passenger vessels, yachts, fishing boats and cargo vessels, were hurriedly utilized, but despite the utmost efforts much congestion ensued, and days were consumed in distances, now, with perfected facilities, requiring but the same number of hours. These medical transports were barely deserving of the name, were not what in naval parlance should be embraced under the term "ambulance ships," as the shortness of the passage obviated the necessity for facilities other than the most temporary. While this class of conveyance was gradually solving the above problem of relieving the pressure on the base hospitals in France, the navies of the belligerent nations were, of course, providing themselves with hospital and ambulance ships for future contingencies. Operations on a large scale of contending fleets have not as yet materialized, owing to the Fabian policy of the Germans. The engagements in the South Pacific and South Atlantic have been of a squadron nature, and in the absence of hospital ships. The two semi-important conflicts in the North Sea have been so close to a

home base that the hospital ships have been held to the coast as floating base hospitals rather than cruising hospital ships. The necessary secrecy of war plans makes it impossible to enumerate the number of such vessels now commissioned, but it is known that all are now amply provided. Not only has a class of thoroughly equipped hospital ships been completed, with (depending upon the character of the vessel converted and its adaptability for such alterations) operating rooms, X-ray rooms, laboratories, elevators, well equipped and ventilated wards, storerooms, etc., but also the many above-discussed ambulance ships or medical transports, vessels which do not require such complete equipment.

The allied attack upon the Dardanelles has afforded a magnificent testimonial to the efficiency and the indispensability of hospital ships with a landing force, particularly with the absence of shore facilities for base hospitals. The expedition naturally anticipated such needs, but the violence of the conflict, the extremely high morbidity rate, and the failure to establish other than field hospitals ashore, overwhelmed the medical corps at the outset. Additional supply transports were diverted from their own sphere and, after discharge of contents, loaded with wounded and dispatched to home bases, the English to Malta, Port Said, or Alexandria; the French to Marseille or Algeria. In some cases in the early days such shipments of even 1,000 wounded for the two and one-half days' trip to Alexandria were provided with but three medical officers, a few orderlies, and very deficient stores of dressings, etc. On September 30 there were 49 medical transports and hospital ships of the allies on Mediterranean duty. (Brit. Med. Jour., Oct. 9, 1915.)

(*b*) *Ambulance trains and motor conveyances.*—This subject is of very great interest and could be greatly dilated upon but represents the army's burden of responsibility rather than the navy's and will be dismissed with the general statement that its development went through the same phases incident to the other service, embracing annoying and heart-breaking delays in its early establishment, with smoothness and ease developing with experience and expansion. Ordinary passenger trains, goods trains, ammunition trains, each were pressed into service in addition to the few hospital trains available at first, which latter gradually increasing in number and perfecting their schedule, were later able to handle the situation. A detail which might be well to remember that would have relieved much of the early agony is as applicable to naval emergencies—i. e., in times of such great, early, unorganized congestion equip your goods trains (supply ships) with complete medical personnel and outfit on leaving the home base for the front.

Motor conveyances have been of inestimable value, particularly so on the French and German fronts, in an established, little-moving battle line and a region of good roads.

The influence of the facilities for transportation upon results achieved are enormous, dependent upon types of wounds, missiles, and infectivity of surroundings, character of first aid, etc., but all, with few exceptions, demanding the earliest possible removal to some place offering adequate, modern means of prophylaxis and treatment. Civilization demands that the bitter lessons of unpreparedness, with their doles of agony, and death to the sufferers, and the deprivation to the nation, be not lived over each generation or each conflict; that such lessons be learned and digested, and the future profit from the pain of the present.

WAR SURGERY.

(*a*) *Infection.*—This has been abundant, ranging from tetanus and gas gangrene to the ordinary pus organisms. The naval wounded have been naturally very much more free from infection than the military wounded. Wounds sustained aboard ship, while of a more lacerated type, are remarkably clean. The surroundings, the possibility of the washing of the wound by submersion in the sea, all tend to comparatively clean results. Ashore, however, in trench fighting, and particularly in a region of such intensive cultivation of the soil as we find in Belgium and northwestern France, gas and tetanic infection are frequent. Tetanus has been such a menace that a prophylactic injection has been used in each case where possible. As a result present conditions are materially better. It may be stated as a general rule that in military surgery the clean wound is a rarity.

(*b*) The established tenets of military surgery as regards treatnent have not been materially altered—the immediate application of irst-aid, immobilization of parts, and the earliest possible removal o field or base hospital. The longer the delay the greater the morality or crippling, with the possible exception of abdominal wounds. 'he immediate treatment of the latter has always been a question nd is still discussed, with the trend being toward absolute rest with bstinence from food or drink, avoiding any inclination toward reoval; if the latter is necessary, let it be, if possible, in a sitting osture; all this under the proviso that immediate laparotomy is out f the question. Other wounds are better only given first-aid and s soon as possible removed to field or base hospital. The field hosital itself, however, should adopt only the most necessary produres, and deliver its patients to a final base hospital as soon as ipment can be accomplished.

(c) *Dressings.*—First-aid dressings have given good service, but are a far cry from certain preventives of infection. The types of wounds inflicted by shell and shrapnel fire are of too lacerated and extensive a character to insure primary disinfection. Iodin has been given a thorough trial, and while losing considerably in reputation, has maintained its place in the first-aid packet. Most marked benefit from first-aid treatment on the field or in the trench is noted in bullet wounds, particularly in those in which the missile has not tumbled or ricochetted.

The question of antiseptics to be employed has developed little new, other than experimental work on the use of these in a base of oils or paste for injection into or application on large wounds, the elaboration of hypochlorite of sodium as a disinfecting agent, and the use of peroxid of hydrogen, or of free oxygen in the treatment of gaseous gangrene. Light, air, and free evacuation of discharges by open drainage are most important. The open treatment of all infected wounds, with periodical or continuous flushing with saline solution, is giving good results, as well as saving that precious article, surgical gauze and cotton.

(d) Serum therapy is noted principally in the treatment and prophylaxis of tetanus, which, as remarked above, was for a while extremely common. The mortality has varied from 90 to 30 per cent., decreasing with more frequent use of the antitoxin. The latter, if possible, should be given in the trenches, with every wound, in a dose of 20 units.

(e) Gas gangrene or malignant edema has also been a concomitant of the trench fighting and the dirt-infected wounds. This is a revival of a frightful but happily comparatively rare disease which was well known in all hospital work prior to the present antiseptic age, although little seen in the cleaner work of this period. Treatment has yielded little in abating the very high death rate. The ordinary antiseptics are valueless when late and amputation is generally deferred too long, as the toxemia, shock, and depression are profound.

(f) Shock, and particularly what has been named "shell shock," has attracted much attention. Cases have been abundant, with absolutely no external or internal bony or muscular lesions, that have exhibited the most marked mental or nervous aberration, ranging from coma to various local disabling affections, such as blindness, deafness, loss of taste and smell, partial or complete anesthesia, hysterical or epileptiform attacks, cardiac irregularity, vertigo, causeless irritability, fear or terror, amnesia, etc. Treatment has been in the line of greatest disassociation from thoughts of the causative agent or surroundings, substituting therefor home comforts and suggestions.

(*g*) Frostbite was a painful development of last winter's trench fighting. A name that has been applied to it, "trench disease," indicates its association with the trench life; it was little observed among the cavalry or artillery. The affection has been observed without a freezing temperature, as a result of days spent in muddy, undrained trenches, for days up to ankles or knees in mud. Tight boots or anything hindering a free circulation assist in its causation. Large boots, free oiling or greasing of the skin, abundant but not constricting socks or bandages will assist during the present winter in minimizing the loss due to this cause.

(*h*) The character of the wounds has varied with the character of the fighting. In the early German advance bullet wounds were in a great majority, chiefly of the extremities. Later and present trench fighting have provided an abundance of shell and shrapnel, but less of bullet wounds, these latter now more frequent in head and face. The landing at the Dardanelles has gone through the same phases, though the percentage of bullet wounds has been even higher.

Naval injuries have been, of course, mostly of the large lacerated type, due to shell or armor fragments.

Wounds of the various parts, abdomen, skull, joints, chest, etc., could be separately discussed at great length, but developments of the present war have differed little from previously accepted ideas.

(*i*) Poisoning by the inhalation of irritant gases followed the inauguration by the Germans of a revival of one of the oldest forms of attack, curiously augmented in a more horrible form by the ingenuity of a race of scientists. The gas employed is either chlorin or (rarely) bromin, blown down wind from the attacking trench, rolling close to the ground toward and over the enemy's line. The results are those of exposure to a violent irritant, conjunctivitis, photophobia, and intense congestion of all exposed mucous membranes, particularly the entire respiratory tract. Death is either immediate from suffocation, or remote, with intense agony, from a congestive, suffocative bronchitis and massive pneumonia.

Prophylaxis is observed by inhaling through thick wet cloths or towels or through gauze containing a material capable of absorbing the chlorin, such as sodium bicarbonate. Masks have been devised with this end in view, none satisfactory, however. Treatment of the condition is expectant and symptomatic, with relief of suffering by liberal use of morphin.

(*j*) Typhoid has been little of a menace in this war as compared to its former position as a dreaded campaign scourge. Prophylactic inoculation is universal, though not obligatory in the British service, and results have been correspondingly improved. The early months brought fairly frequent reports of its incidence, prior to a thorough systematizing of the injections, but the last few months have demon-

strated typhoid's relative harmlessness. Among the uninoculated of the British expeditionary force in France during the first 10 months of the war the morbidity rate was fourteen times and mortality rate forty-two times greater than among the inoculated.

(*k*) Typhus has claimed many victims in Serbia, Austria, Russia, and a few in prison camps in Germany. The recent demonstration of body lice as the intermediate agent has made it possible to effectually check the advances of this disease, given proper sanitary energy and control. With the close association of men in trench and camp life, eradication of the vermin is extremely difficult, but the results achieved in Serbia have shown what can be done. Sanitary measures are necessarily upon an enormous scale in a conflict of the immensity of the present one. It is of interest to note the precautions taken by the Germans in disinfecting large bodies of troops. The measures adopted to stamp out the disease include the conversion of large factories, notably sugar factories, into stations for disinfecting soldiers and their clothing. Some of these are large enough to cope with 12,000 to 15,000 men with their clothing every day. The men are thoroughly washed with soap in baths, while their clothing is disinfected by steam and leather articles by dry heat. In many prisoners' camps experiments have been carried out with a view to ascertaining the cheapest and most effective way of destroying lice, and Prof. Galewsky has given the following account of his experiments in a prisoners' camp in Königsbrück: A building, used by Russian prisoners, nearly all of whom were infested with lice, was selected for the first experiment. All cracks, crannies, and corners were washed with a 3 per cent solution of kresol soap and were then filled up. The clothing was hung up loosely, with the exception of a parcel of shirts, which were tied into a firm bundle. In this building, the floor of which measured 450 square meters, 25 kilos of sulphur were burned in 16 sulphur stoves. The burning proceeded rapidly, and reached its maximum in 45 minutes. After three hours the doors and windows were again opened, and two hours later the building was occupied by the prisoners, who had meanwhile been washed. The lice and their eggs were found to have been completely destroyed, except in the tightly packed parcel of shirts.

(*l*) The percentage of wounded who eventually find their way back to the fighting line has varied during the progress of the war from an early 30 to 40 per cent to at present 70 to 90 per cent, the latter figure representing some of the results claimed by the Germans. The incidence of mortality in its relation to total injured is of interest, approximating in military work former wars. The present ratio is about 1 to 3.2. This is in marked contrast to naval figures, where 9 are lost while 1 is injured. However, naval casualties include loss

by drowning, which accounts for by far the greater majority of all lost. This was pointed out by Surgeon T. W. Richards in a very interesting article in the April, 1912, number of the Naval Medical Bulletin, as characteristic of all great naval battles, and his remarks are as applicable to the present as to the past.

NAVAL ENGAGEMENTS.

As remarked earlier in these notes, little has been added to our sum total of knowledge indicating any advance in technic or equipment by the engagements off Coronel, the Falklands, the North Sea actions, etc. The victors in each case have suffered little damage, insufficient to render provided facilities inadequate, while the losers have generally lost all. Indications are that the arrangements of battle dressing stations, stretcher parties, first-aid work, etc., as at present carried out or planned in our Navy, are used with success in the contending fleets. The need of drilled assistants from the crew has been demonstrated repeatedly, and at times the stress of work has necessitated the giving of great independence and initiative to such stretcher parties.

SANITATION.

The discussion under typhus presents one phase of the immensity of sanitary measures along one small line. Other topics that might be discussed, and to which valuable data have been added, are hygiene and sanitation of prison camps, trenches, lines of communication, concentration camps, new hospital construction, water supply, drainage, food, laundering and disinfecting facilities, disposal of remains, and many others. The sanitation of submarines, the question of their air supply for prolonged submersion, their food supply, cooking, disposal of excreta, all are being added to daily, but less is available in this than almost any other line, owing to the jealous secrecy of each nation regarding developments that may benefit their opponents.

To close this most brief epitome of some of the numerous developments constantly going on over the great battle front, attention is invited to the fact that the tremendous scope of medico-military matters of interest has hardly even been hinted at. Volumes could be and will be written on each minor subhead. Reports from observers behind the French and German lines have been of inestimable value and embrace material that allows us to foresee and be forearmed against future contingencies, and to avoid many of the pitfalls and errors which only experience taught to the now struggling armies and navies.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

E. THOMPSON, Surgeon, and E. L. WOODS, Passed Assistant Surgeon, United States Navy.

MACKENZIE, Sir J. **The recruit's heart.** Brit. Med. Jour., Oct. 16, 1915.

At the request of the War Office and on account of the rejection of a large number of healthy young men on account of some cardiac manifestation, which the examiner took to be abnormal, Sir James Mackenzie has prepared a memorandum for medical examiners.

It is stated that the healthy heart in the young can exhibit murmurs and variations in rate and rhythm which are perfectly physiological in origin and indicative neither of disease nor of impairment.

Before examining the heart find out the *functional efficiency* by ascertaining how it responds to effort. To ascertain this find out the amount of exertion the candidate has been accustomed to in his work or play and whether he can undergo severe bodily exertion without distress.

As to *murmurs*, Sir James states that physiological murmurs are always systolic in time and the situation of greatest intensity may be at the apex, mid-sternum, or base of the heart. If the candidate's response to effort be normal, and the heart normal in size, the murmur is negligible, for it is manifest that if the cause which produces the murmur hampers or embarrasses the heart in its work the size of the embarrassed chamber will increase and its functional efficiency be impaired.

As to *irregularities* of the heart, the author states that those indicating serious mischief, as irregularity of auricular fibrillation or of heart block, will be associated with such diminution of functional efficiency that the candidate would not seek enlistment. The most common type of irregularity is that which occurs in the healthy heart of the young. It is characterized by a lengthening and shortening of the pauses between the beats; it will often be found to vary with the respiration, the beat increasing in rate during inspiration and decreasing during expiration. When it does not have the characteristic respiratory character it can be made to take this on by having the candidate breathe slowly and deeply for a few minutes. It is frequent in perfectly healthy hearts, and is therefore of no importance.

In rare cases the heart may be found intermitting more or less frequently. If the heart is ausculated, two short, sharp sounds rapidly following one on the other may be heard during the pause. If this is the only sign present—that is, if the functional efficiency of the heart be good and the size normal—then these extra systoles are of no significance and the candidate should not be rejected.

As the result of excitement many perfectly healthy hearts suffer from palpitation or excited action of the heart during examination. The heart beat becomes forcible and rapid and a systolic murmur may be present. If such a candidate be told to lie down and breathe slowly and deeply for a few minutes, the heart's action becomes less violent and the rate slows during expiration.—(E. R. STITT.)

ROLLESTON, H. D. **Report on cerebrospinal fever in the Royal Navy (August, 1914–August, 1915).** Jour. Roy. Nav. Med. Service, October, 1915.

This is a history of 170 cases in the navy for the year. The mortality was 52.9 per cent. The incidence of the disease seemed to be associated with the presence of "carriers" in overcrowded quarters. The greatest number occurred in the months of January, February, and March. Of course if carriers could be eliminated the disease would be abolished. The difficulties lie in the detection of healthy carriers; this could only be attempted by the examination of every man in the service, and as the carrier state is usually of short duration (about three weeks), and as some carriers are intermittent, showing the presence and absence of meningococci alternately, the work thus involved would be prohibitive. It is also possible that the meningococcus is only a phase in the cycle of a pleomorphic microorganism, and a carrier will not be detected if cocci alone are sought. Abortive cases are a great source of contagion. Unless there are known cases of cerebrospinal fever present to cause suspicion, some will pass as influenza or head colds, etc.

After a detailed history of epidemics in various barracks and ships, the author sets forth recommendations as to the prevention of the introduction and spread of the disease. Any person who develops catarrhal symptoms of the nose or pharynx should be examined bacteriologically. In the month of December examination should be made as extensive as possible, as the epidemics seem to start in January. The intermittent carriers are so dangerous that it would be best to discharge from the service all those who have recovered from an attack of cerebrospinal fever. Overcrowding should be avoided. An increase in catarrhal disease, such as influenza, tonsillitis, coryza, and sore throat, often precedes an epidemic of cerebrospinal fever. These cases should be isolated as far as possible until

their true character is established. Special care should be taken to prevent the common use of handkerchiefs and towels.

To prevent the spread, complete disinfection and sterilization should be done. This should begin with the entire dormitory. Contacts should be isolated and repeatedly examined. The evidence that carriers spring up freely around a case makes it necessary to include "contacts" into a wide group. It should include all in the same sleeping place and all others who have been intimately associated with the sick person. When isolation of contacts is practiced, those with any naso-pharyngeal inflammation should be segregated from the apparently well.—(E. T.)

RUGGLES, H. E. **Roentgen-ray treatment of leukemia.** California State Jour. Med., September, 1915.

Since 1903 there have been a great number of cases of leukemia treated with the roentgen-ray. The author states that the usual results have been more or less rapid improvement in general condition, lowering the white count and return to normal of differential count. Large doses of the rays must be used in order to prevent relapses, which are very difficult to control.

The primary effect of radiation is degenerative. In 10 to 14 days lymphocytes, myelocytes, myeloblasts, and even polymorphonuclears show swelling of nucleus and fragmentation of chromatin. Protoplasm is at first unchanged; later it becomes clear or vacuolated, and then the cells disappear. After prolonged courses of radiation a secondary reactive effect appears. Myeloid cells completely disappear from the lymph nodes and spleen, and the organ becomes a fibroid mass containing scattering lymphoid cells. Spleens frequently show anemic infarcts, thrombosis of vessels, and obliterating endarteritis.

Success depends entirely on the way radiation is given. There is considerable discussion as to whether the long bones or the spleen should be exposed. Probably the best results are obtained by exposing both.—(E. T.)

OPHÜLS, W. **Chronic lead poisoning in guinea-pigs; with special reference to nephritis, cirrhosis, and polyserositis.** Am. Jour. Med. Sc., October, 1915.

Ophüls from experiments performed upon guinea-pigs, in which as a rule one-half grain of carbonate of lead was given three times a week, reached the following conclusions:

1. Chronic lead poisoning in guinea-pigs produces severe degenerative changes in the epithelium of the kidneys and of the liver,

leading to necrosis. These destructive lesions are partly compensated for by constant regeneration.

2. In the kidneys these lesions may eventually cause collapse of certain groups of tubules associated with moderate proliferation of the connective tissue and some chronic inflammatory changes. The glomeruli in these foci usually show a fibrous thickening of the capsule. In exceptional instances the defects produced in this way are large enough to cause a somewhat granular gross appearance of the organs.

3. In the liver large areas of collapse occur much more frequently, so much so that marked irregularity of the surface resembling that observed in human cirrhosis is quite common. The connective tissue proliferation associated with this process is extremely limited. The condition, therefore, can not well be classified as cirrhosis, but should be designated as a chronic focal atrophy.

4. Chronic lead poisoning in guinea-pigs produces general increased permeability of the blood vessels leading to the production of effusions, usually of a hemorrhagic character, into the serous cavities. These are most commonly observed in the pericardium, but the pleuræ and the peritoneum are often also involved in the process. False membranes are apt to form on the surface of the serous membranes, and their organization leads to the development of the picture of a chronic polyserositis with fibrous thickening and sometimes adhesions. If this condition is more especially localized in the pericardium there may be the appearances of a pericarditic pseudocirrhosis; if more in the capsule of the liver, that of a *Zuckergussleber* may be reproduced.—(E. L. W.)

Allen, F. M. **Prolonged fasting in diabetes.** Am. Jour. Med. Sc. (From the Hospital of the Rockefeller Institute for Medical Research, New York.)

Partial pancreatectomy, with preservation of the pancreatic duct so as to avoid atrophy of the remnant, gives a more satisfactory reproduction of clinical diabetes than is afforded by Von Mering and Minkowski's total pancreatectomy or Sandmeyer's method of slow pancreatic atrophy. As previously pointed out, animals thus prepared constitute valuable test objects and afford favorable opportunities for research concerning diabetic therapy.

The treatment of diabetes at the Rockefeller Hospital has been based upon these animal experiments. The patients admitted have been 44 chosen as the most severe out of a considerable number of applicants and representing a sufficient variety as respects age, social condition, and other factors. Present experience indicates that the glycosuria, in cases of even the severest type of diabetes, may with advantage be cleared up by one initial fast. The necessary duration

may sometimes be as long as 8 or 10 days; severe acidosis, which is known to be diminished by the shorter fasts previously employed, is still more reduced by the more prolonged fasting. Dangerously weak and emaciated patients have borne the fasting with apparent benefit, giving the impression that they had been suffering more from intoxication than from lack of nutrition. Alcohol is valuable during fasting as a food which does not produce glycosuria, though its use is not essential. Broadly speaking, freedom from glycosuria seems attainable in all cases of uncomplicated human diabetes before there is danger of death from starvation.

One case of incipient gangrene and one dangerous carbuncle cleared up rapidly under fasting, and threatening complications of infectious or any other character are considered an indication for the radical treatment as described. No contraindication has been met, unless it be the appearance of nausea, vomiting, and prostration while fasting. One man began to vomit and feel unwell on the seventh day of fasting. He was fed and the symptoms immediately passed off. After two weeks of restricted diet a second fast easily cleared up the glycosuria. This simple precaution apparently prevents danger even in this rare type of cases, and in other cases there has never been any sign of danger or harm. It is unquestionably true, in accord with Joslin's warning, that when glycosuria is abolished and strength diminished by long fasting, and then glycosuria and acidosis allowed to return through improper diet, the last state of that man may be worse than the first. After the fasting patient has been completely sugar-free for one or two days, feeding begins, and the tolerance of the patient for carbohydrate, protein, and fat is determined. Any trace of glycosuria is the signal for a fast day with subsequent modification of diet, and routine fast days are often used as frequently as once a week even in absence of glycosuria. Two principles in the management of severe cases are mentioned: The benefit of keeping the patient permanently below weight and the advisability of restricting the quantity of fat in the diet. The present idea is, that the reduction of weight is in itself beneficial to the diabetic condition and serves to spare the weakened function and increase tolerance. Any increase in weight that is possible, without return of glycosuria or ketonuria, is permitted. The principle tentatively suggested that increase of weight or metabolism increases strain upon the internal pancreatic function, and reduction of weight or metabolism reduces the strain, is new, and if it proves valid will be a useful general guide in treatment. The general policy of insisting upon prompt and lasting freedom from glycosuria and acidosis in all cases of diabetes, even the most severe, is a new one. In addition, the main features wherein the proposed treatment differs from the pre-

viously established methods may be summarized under the following five headings:

First. An initial fast sufficient to clear up glycosuria in any case, and then one or two days longer.

Second. A subsequent diet sufficient to keep glycosuria and acidosis permanently absent, with as many interspersed fast days as necessary for this purpose.

Third. Keeping most severe diabetics intentionally and permanently at a sufficiently low level of weight and metabolism in the belief that return of symptoms and downward progress is thus prevented.

Fourth. The patient's tolerance for fat and calories should be followed in the same way as the tolerance for carbohydrates and proteids.

The fifth feature consists merely of routine or incidental matters, which are not without practical importance. Among these may be mentioned:

(1) The diet, which should not overtax tolerance, yet satisfy the patient so that it will be continuously followed at home.

(2) The absence of any specific craving for carbohydrates such as diabetics are supposed to manifest, and the contradiction of the prevalent idea that most severe diabetics can not be trusted.

(3) The avoidance of the need of alkali for more than a few days.

(4) The principle of clearing up the urine quickly.

(5) Instruction of the patient in the simple means of controlling his own condition, through diet, body weight, and the daily testing of urine (by the patient) with Benedict's solution.

The immediate results as observed up to the present have appeared uniformly beneficial. Reports from a number of clinicians experienced in the older methods of treating diabetes agree that their results under the new method are more favorable.

As respects the remote results and the influence on the ultimate prognosis of severe diabetes, longer experience must decide. Whatever the ultimate outcome, two conclusions seem justified by present knowledge:

(1) That this treatment removes glycosuria and acidosis more quickly and surely than has been the practice heretofore.

(2) That patients do better when glycosuria and acidosis are removed than when they are allowed to continue.—(E. L. W.)

Proper dosage of antitoxin in diphtheria. Weekly Bull., Dept. Health, N. Y. City, Nov. 13, 1915.

The following is quoted verbatim from the above report:

"The attention of physician readers is called to the following table of the doses of diphtheria antitoxin recommended in the treatment of

diphtheria. This table was prepared by Dr. William H. Park, director of the bureau of laboratories of this department, on the basis of extensive experimental and clinical studies. The recommendations have been indorsed by the Medical Board of the Willard Parker Hospital and by the diagnosticians of the bureau of preventable diseases. The table of doses here given has been issued by the commissioner of health as an order for general department procedure. In passing, it may be stated that there is no advantage in excessive or repeated doses.

	Mild cases.	Moderate.	Severe.	Malignant.
	Units.	*Units.*	*Units.*	*Units.*
Infants, 10 to 30 pounds in weight (under 2 years of age)	2,000-3,000	3,000- 5,000	5,000-10,000	10,000
Children, 30 to 90 pounds in weight (under 15 years of age)	3,000-4,000	4,000-10,000	10,000-15,000	15,000-20,000
Adults, 90 pounds and over in weight	3,000-5,000	5,000-10,000	10,000-20,000	20,000-40,000

"Cases of laryngeal diphtheria, moderate cases seen late at the time of the first injection, and cases of diphtheria occurring as a complication of the exanthemata should be classified and treated as 'severe' cases.

"In all cases a single dose of the proper amount, as indicated in the schedule, is recommended. For immunizing purposes a dose of 1,000 units should be used.

"It is recommended that the methods of administration be as follows:

"Mild cases: Subcutaneous or intramuscular.

"Moderate cases: Intramuscular or subcutaneous.

"Severe cases: Intramuscular or subcutaneous or intravenous.

"Malignant cases: Intravenous."—(R. C. R.)

MENTAL AND NERVOUS DISEASES.

R. SHEEHAN, Passed Assistant Surgeon, United States Navy.

GROSSET. **Clinical lecture on the psychoneuroses of war.** Med. Press and Circular, June 9, 1915.

In common with Dr. W. A. Turner, writing separately in the British Medical Journal, under date of May 15, 1915, on "Cases of nervous and mental shock observed in the base hospitals in France," Dr. Grosset describes deaf-mutism (occasionally, but less frequently, blind deaf-mutism) as one of the clinical surprises of the great war. These cases are caused by the explosion of big shells in close proximity to the patient. The shock is both physical and mental. "A typical instance is the bursting of a shell at close quarters by which a soldier is hurled several yards through the air and more or less completely buried beneath earth or the bodies of his comrades. He loses consciousness, and on recovery, especially if he be in an emotional or overtaxed con-

dition, finds that he can neither see, hear, nor speak. * * * He is unable either to convey or receive impressions."

Dr. Grosset suggests, as an explanation of the psychology of these cases, that these patients probably think that they have died, as the only thing which combines such a patient to existence is the preservation of his sensibility and sense of movement. The remarkable example is cited of an ingenious nurse who placed a pencil in the hand of one of these blind deaf-mutes, and guided it while she wrote a question on a piece of paper. The patient replied to the question, writing the answer in a firm round hand. "In these cases sight usually returns first, hearing next, and speech last of all. Both sight and hearing may suddenly return."

Among the less interesting psychoneuroses produced by shell shock are traumatic neuroses, the most important clinical manifestation of which is hemiplegia, or, rather, anesthetic hemi-impotence; hysteria, neurasthenia, disturbances of sleep, and changes in character, as well as various psychoses. The opinion is expressed that personal and hereditary antecedents (ante bellum) have comparatively little value in the psychoneuroses of war, but that in the etiology of the psychoses the personal and hereditary elements play infinitely the more important rôle.

Out of 193 cases of traumatic lesions of the nervous system examined by Dr. Grosset during the first three months of his service, 59 cases of psychoneuroses were found.

It is stated that the marked psychoneuroses are not as a rule provoked by the graver injuries. "The origin is more dramatic. The explosion of a bursting shell which hurls the victim 3 or 4 yards through the air and frequently buries him beneath corpses and débris: the explosion of a shell in the trenches in his immediate vicinity by which the comrades at his side are killed, men who are perhaps breakfasting with him; an explosion which kills a comrade and perhaps hurls the lifeless body at him; the impact of a projectile which bruises and stuns without actually wounding him; these are the originating causes of the psychoneuroses of war. * * * When the victim recovers consciousness, which he does sooner or later, he finds that he is paralyzed. He thinks that he has lost one of his limbs. He is blind, deaf, and dumb, or he is in a shattered and anxious mental condition."

Both articles are well written and should be found very interesting to anyone interested in this class of patients, the number of whom is bound to be greatly increased as the war continues. War conditions "try men's souls" probably more than any other human experience. Psychoses and psychoneuroses are certain to claim a tremendous toll as one of the aftermaths of war.—(H. BUTTS.)

MacCurdy, J. T., and Treadway, W. L. **Constructive delusions.** N. Y. State Hosp. Bull., August, 1915.

The writers state that if delusions are to be an index to deterioration they must in some way hold a mirror to the changes in the personality, repeat them, or prefigure them. In dementia there is a loss of the sense of reality. May we not hope to find in the content of the psychosis some objective criterion as to the degree in which the sense of reality is lost, with all that implies?

They consider that delusions in dementia precox which take the form of objective speculations rather than subjective experiences are an evidence of a milder psychotic reaction, and hence warrant a prognosis of chronicity rather than deterioration, and that scattering of thought arises from failure to formulate underlying fancies in an objective way; that the insanity of ideas depends not on themselves but on the critical judgment of the age which produces them; and, lastly, that there are essential psychological differences between creeds and religious delusions.—(R. S.)

Leahy, S. R. **Some observations on heroin habitués.** N. Y. State Hosp. Bull., August, 1915.

This subject is of considerable interest to naval medical officers because of the occurrence of this habit among enlisted men. At the Kings County Hospital, Brooklyn, N. Y., from July 1, 1914, to March 1, 1915, 139 heroin habitués were received. This serves to indicate its prevalence.

It was noticed that the patients are usually undersized and poorly developed physically. They are pale appearing, but examination failed to reveal any gross physical disorders except in two cases, who were tuberculous. All appear somewhat underweight. There are no characteristic neurological findings except a dilation of the pupils, which always were found to react promptly to light. They do not present a typical picture of the constant drug user.

It was noticed that the patients slept longer in the morning than was their usual custom, appeared to be without ambition at their work, and took little interest in anything. They frequently had to give up their positions because their work was unsatisfactory. It was usual that they had not worked for months, and one case had been without occupation for four years. When patients were without the drug they were irritable, restless, and unable to sleep. They are nervous and suffer from vomiting and complain of abdominal cramps and general weakness. After a time cramps in the legs, pains in the joints, and twitching of the legs occur. The gastrocnemius muscle may go into a tetanic contraction, which is quite painful but does

not last long. The patients are sleepless, restless, noisy, and complaining. After two or three days the withdrawal symptoms gradually subside. They are then able to take solid food, improve rapidly, and soon are in excellent condition.

The initial effects of the drug are nausea and vomiting, followed by somnolence, which wears off after taking it three or four times, so that later the effect is almost entirely one of somnolence, with an increasing dose necessary to produce the effect.

The dose varies from 0.50 to 1.20 cg. a day and may be as much as 4 in three days.

In nearly all cases the drug is taken by snuffing from a piece of paper made into what is known as a "quill." It is usually taken into the same nostril, which reveals areas of inflammation.

After a week or two of deprivation they do not show any special craving, and are apparently happy and contented.

Many give a history of having been in reformatories for petty crimes; others are members of gangs. Others live with prostitutes and are sexual perverts, although the drug removes sexual desire. They give a history of a bad record at school, and afterward were unsuccessful, changing occupations frequently, and were regarded as peculiar, so that they can be regarded as of defective make-up. They are evidently easily suggestible. There seems to be no well-defined reason for acquiring the habit, except to "see how it felt."

The majority of these cases are born in the United States. Practically all are of the moron type. There do not appear to be any permanent effects of the drug.—(R. S.)

ANDERSON, V. V. **A proper classification of borderline mental cases amongst offenders.** Boston Med. and Surg. Jour., Sept. 26, 1915.

This is the preliminary of a series of articles acquired from experience with cases handled by the municipal courts in Boston. It considers these individuals as "failures of mental adaptation." A great host of repeated offenders—recidivists who seem unable to properly adjust themselves to society's customary requirements—have, as a fundamental basis of their lack of adaptability, a mentality that deviates from the normal, and would seem, if looked at purely from the social point of view, to be all of them defectives. However, the percentage is lower, ranging from 10 to 30 per cent. The remaining 90 to 70 per cent comprise a group that are important, which are neither feeble-minded nor insane, but who are clearly abnormal mentally. These seem unable to profit by any treatment and are best regarded as moral imbeciles or defective delinquents. These give no evidence of mental defect, but their conduct is abnor-

mal, they have certain character defects, and they are antisocial. They are impulsive, vehement, inhibitionless, and emotional; in other words, they are easily unbalanced and thus liable to serious social difficulties in a complex environment. They are psychopaths. Then, there is a group which is clearly not pathological but psychological, the mental delinquents. These have a fair amount of intelligence compatible with their station in life, a stable mentality, are cool and calculating, deliberate, indolent, superficial, very selfish, egoistic, heartless, and even cruel. They are strongly individualistic, being nonsocial. They are that as a result of lack of socializing influences at their developmental period.

These three definite groups, the psychopaths, the mental delinquents, and the mental defectives, constitute the very essential of recidivism, and the institution of proper remedial measures, fitting the requirements of each particular group, would enable society to make immense strides in handling the crime problem.—(R. S.)

DAVENPORT, C. B. **The feebly inhibited. Violent temper and its inheritance.** Jour. Nerv. and Ment. Dis., September, 1915.

This is one of a series of studies made of 165 family histories of wayward girls in State institutions. It attempts to decide how far heredity plays a rôle in those traits, usually of a highly "emotional" sort, that lie at the basis of criminal behavior. It takes up (*a*) Outbursts of bad temper in families with epilepsy. They are characterized by sudden onset in persons of a generally disagreeable disposiion, and by tendency to assault others and occasionally to hurt oneelf and destroy things. (*b*) Outbreaks of bad temper in families vith mania; that is, manic-depressive or allied psychoses.

There are angry spells when the patient becomes much excited with or without elation), and under these circumstances is often ritable, abusive, even assaultive, and sometimes swears, storms, and akes a great disturbance, becomes easily discouraged, gets depressed, en contemplates suicide. It usually occurs after a period of incubaon during which melancholia prevails. A violent reaction takes ace in sudden paroxysms. These vary from simple excitement to ry. There is a flood of ideas and an expansive humor.

(*c*) Hysterical outbreaks of temper. In these there is no clear dence of epilepsy or manic-depressive psychosis in the near relaes. Patient shows, especially at menstrual period, an excited ack preceded by about two days of increasing restlessness. At the sis the patient sings, swears, bangs about movables, threatens to e her own life and that of others. The acute attack lasts for a y or two and is followed by a period of depression and inactivity

for a day or two, after which the patient's reactions return to a normal level.

All of these patients are different from other people (even their own brothers and sisters) in that, at more or less regular intervals, they react explosively to a wholly trivial circumstance. It is concluded that—

1. The tendency to outbursts of temper—"tantrums" in adults—whether more or less periodic or irregular and whether associated with epilepsy, hysteria, or manic or not, is inherited as a positive (dominant) trait, typically does not skip a generation, and tends ordinarily to reappear, in the average, in half of the children of the affected parent.

2. It would seem to follow that epilepsy, hysteria, and mania are not the causes of the violent temper frequently accompanying them. The violent outbursts are in no clear sense the "equivalent" of these various psychoses. Rather the violent outbursts of temper are due in all three associations, to a factor that causes periodic disturbance (possibly paralysis of the inhibitory mechanism?). This factor has the greatest effect when acting on a nervous system that is especially liable to show the other psychosis. In other words, "tantrums" are apt to be associated with these various neurotic conditions while they have no necessary connection with them.—(R. S.)

SURGERY.

A. M. Fauntleroy, Surgeon, and E. H. H. Old, Passed Assistant Surgeon, United States Navy.

Squier, J. B. **Renal pain: Diagnostic and clinical significance.** Surg., Gynec. and Obst., October, 1915.

It has been shown by various investigators that pain is due to stimulation of some portion of the cerebrospinal nervous system, and is manifested by being referred to the peripheral distribution of cerebrospinal sensory nerves in the external body wall, and that pain is elicited only by stimulation of structures supplied by the cerebrospinal nervous system. This hypothesis explains pain resulting from visceral irritation. When a viscus is the focus of an irritative process there is conducted through the sympathetic system the impulses of visceral irritation. The stimulating effects of these on the cerebrospinal sensory nerves center in the cord, transfer the pain to the peripheral distribution of these nerves, and establish a viscerosensory reflex. Should stimulation of the cord affect a contiguous motor center, the skeletal muscles contract, producing a viscero-motor reflex. Recognition of these factors in pain production is extremely important in interpreting the diagnostic value of pain.

The most frequent pathological conditions often confounded with renal lesions on account of the symptom of pain are: Coincident disease of the gall bladder and ducts, gastroduodenal ulcer, appendicitis, and affections of the large intestine. There must, however, be combined with the pain symptom other associated symptoms in order to complete a true diagnosis and in this connection may be mentioned the presence of pathological products in the urine, variations in the amount of urine, frequency of micturition with or without tenesmus, etc.

Beginning renal affections are usually painless, and many of them remain so. Changes in the parenchyma of a glandular organ seldom cause pain, and it is practically accepted that in order to produce pain there must be stretching, tearing, or pressure upon the capsule of a parenchymatous organ. Diseases of the kidney structure *per se*, as with affections of other glandular organs, are nearly devoid of sensibility.

The type, original, and final location of pain, and its path of radiation must all be considered in interpreting renal pain. True renal pain is located in the flank and lumbar region, is of dull, aching quality, constant in character, never paroxysmal, and without radiation. Pelvic or ureteral pain is diffused from the lumbar region along the iliac crest, is of paroxysmal or colicky quality, of varying intensity, and intermittent in character, radiating through the inguinal region into the scrotum or rectum, or on to the thigh. The line of radiation is clinically along the ureter, bladder, and scrotum, but anatomically along the distribution of the iliohypogastric, ilioinguinal, and genitocrural nerves. The skin of the scrotum, being supplied by the sacral nerves, is never affected in true renal pain.

In order to prove that the pain is of renal origin it must be correlated with some associated finding, e. g., pain with pus but without cystitis suggests the calculus group; pain with pus, with cystitis, suggests the tuberculous group; pain without pus, without cystitis, plus a tumor suggests the aseptic hydronephrotic group; pain with tumor, with pus, with or without cystitis, suggests the septic hydronephrotic group; pain with blood, without cystitis, the neoplastic or essential hemorrhagic group.

The pain from lumbago, often mistaken for renal pain, is worse in the morning, but improves as the day progresses and lessens by movement or active exercise, while renal pain is less after a night's rest, becoming worse toward evening and is considerably augmented by active locomotion.

Distention of the renal pelvis and upper third of the ureter is associated with urinary frequency, but is usually without painful micturition.—(H. W. COLE.)

GERAGHTY, J. T. **Fulguration in the treatment of bladder tumors.** Surg., Gynec. and Obst., August, 1915.

Attention is drawn to the fact that confusion exists in regard to the types of bladder tumors suitable for fulguration and it is pointed out that the hard, lobular, infiltrating carcinomata receive more harm than benefit from fulguration, but this treatment, when applied to typical benign tumors, produces results far superior to any other procedure.

The diffuse papillary and sessile tumors, always carcinomatous, and the carcinomatous papillomata are regarded uncertain in results following fulguration. Beer is certain that the high-frequency current is effective in benign tumors only, though many other surgeons have shown the apparent cure of the malignant types.

The author's article can be summarized as follows: He uses the Oudin, or unipolar, current and states that it is just as effective as the bipolar. There is no eradication of a sessile tumor or one presenting infiltration of the base, though much symptomatic relief is produced. In this treatment the benign tumors respond more quickly than the malignant.

Fulguration is stated to be far superior in results to the most radical operative procedures and should be used on papillomata, both benign and malignant, providing infiltration of the bladder wall has not occurred.—(H. W. COLE.)

WARREN, G. W. **Some details in the surgical treatment of tumor of the bladder.** Surg., Gynec. and Obst., August, 1915.

The author, though admitting that recent statistics show that bladder tumors are showing the best results from treatment by fulguration, is of the opinion that surgical procedure will eventually be the method of choice. He claims that the inability to make an early diagnosis of malignancy in bladder tumors without microscopic examination gives rise to the present popularity of fulguration, and that many cases of simple keratosis and irregularities of the vesical mucosa are treated and reported as cured, thus swelling the statistics in favor of fulguration.

The writer excises the entire bladder wall at the region of the tumor, using the extra-peritoneal route, thus obviating the necessity of opening the peritoneal cavity and causing a corresponding reduction in mortality from peritonitis. The bladder is freed from the peritoneum and adjacent tissues only at the point of resection. If the tumor is situated near the trigonum, only one side of the bladder need be freed, but if the growth is located upon the back or upper

portion of the bladder the peritoneal cavity may have to be opened, as the peritoneum is sometimes adherent to the bladder overlying the tumor. The attachment of the urachus usually has to be severed to permit free exposure of the bladder with a tumor thus situated. The cutting of the urachus opens the peritoneal cavity. The drainage tube usually infects the denuded area, and this is the main objection to freeing any more of the bladder than was absolutely essential to removal of the tumor. Extreme care must be taken to prevent loose particles of tumor tissue from coming in contact with the incised areas, as there is grave danger of recurrence due to transplantation. Even touching or handling the tumor frequently gives rise to a recurrence, which generally takes place at the site of the bladder wounds. The amount of bladder tissue removed can be very great, and, as far as capacity is concerned, the result will be good. Tumors of the bladder overlying the prostate are almost impossible to resect. Cases of multiple vesical tumors do badly with partial resection of the bladder, and if surgical interference is undertaken, it is recommended to remove the whole bladder.—(H. W. COLE.)

WRIGHT, Sir A. E. **Wound infections.** Proc. Roy. Soc. Med., viii, No. 6, April, 1915.

In the present war practically every wound is heavily infected. The clothes and skin of the soldier become contaminated with filth containing pathogenic organisms and spores; the missile takes these in with it and implants them far beyond the reach of any prophylactic applications of antiseptics. Blood and lymph are now poured out in the track of the projectile and there results a mixed infection of a streptococcus with fecal bacteria, the latter being a specially prominent feature of this war.

Two of these intestinal bacteria have a special importance, they are the *Bacillus aerogenes capsulatus* and the tetanus bacillus. Their presence makes the first period of the wound infection a critical time for the patient. The streptococcus may invade the tissues and set up cellulitis or erysipelas; the tetanus bacillus may induce tetanus; or the gas bacillus may produce a gas phlegmon and obstructive gangrene in the distal portion of the limb.

When the wound has been opened and aerobic conditions established its bacterial flora changes; the ordinary pyogenic infection now gains the upper hand, and instead of an infection of the imprisoned discharges we have now an infection of the granulating wound surfaces and of the flowing discharges. The streptococcus, staphylococcus, and *Bacillus proteus* are now the chief bacterial agents.

FUNDAMENTAL CONSIDERATIONS IN REGARD TO TREATMENT.

We have at our disposal 3 distinct therapeutic measures—antiseptics, physiological methods such as opening and draining of the wound, and third, vaccine therapy. The second is beyond all comparison the most important. We can not apply any of these measures aright unless we first understand the physiological processes going on in the wound. To make these processes clear Wright describes at great length the technic of the experiments which have enabled him to answer the following questions.

(1) *Can the microbes which are found in wound infections live and multiply in the unaltered blood fluids?*

In the highly diluted fluids a pure culture of streptococcus develops; in the lower dilutions staphylococcus and an anaerobic diphtheroid bacillus also appear. All the other pyogenic microbes appear to be inhibited in undiluted normal serum, and when they put in an appearance it is comparatively late and in concentrated pus.

(2) *Does the lymph which pours into the wound provide a favorable nutrient medium for the microbes which have been growing in that wound?*

The lymph as it flows out contains streptococci in practically pure culture with actively phagocytic leukocytes. In the wound it is quickly converted into a fluid which is ideally favorable to the growth of microorganisms.

(3) *What is the cause of that corruption of the lymph which converts it into a favorable nutrient medium for sero-saprophytic microbes?*

This condition is brought about by a digestive process. The blood has an antitryptic element, and the reduction of this antitryptic power is the prime cause of its corruption. When trypsin is added in quantities sufficient to reduce the antitryptic power but insufficient to give us any free trypsin, the serum is converted into an eminently favorable nutrient medium for sero-saprophytic microbes.

EMIGRATION OF WHITE BLOOD CORPUSCLES INTO THE WOUND.

White blood corpuscles will move out in any direction toward a chemotactic substance. They will emigrate more freely downward than horizontally and more freely horizontally than upward. Anaerobic conditions are more favorable to emigration than aerobic conditions. Emigration goes on unaffected in the presence of ether, but is abolished or suspended in an atmosphere of chloroform. Physiological salt solution induces a very vigorous emigration of polynuclear white blood corpuscles. Weaker salt solutions induce

a less vigorous emigration, and water again a less vigorous. Strong salt solutions, 5 per cent, suppress emigration.

Bacterial suspensions which have been sterilized by heating evoke, according to the dilution, quite different effects. The general rule applying to bacterial suspensions would seem to be as follows: Concentrated suspensions usually completely suppress emigration, diluted 10 or 100 times they evoke vigorous emigration.

Wright describes in detail a method of studying emigration of leukocytes and anticipates that at no distant date we may secure information which will enable us to activate or restrain the emigration of leukocytes into the wound. We may hope also to determine in connection with every antiseptic or other solution which is brought into application in a wound, whether it promotes or hinders emigration.

TREATMENT BY ANTISEPTICS.

If we were to inquire of the first man we found engaged in washing out a wound what were his reasons for doing so, he would probably reply that antiseptics are agents which inhibit and kill microbes; that there is no other agency to do the same work in the wound; that Lister, by introducing antiseptic treatment, put an end to the septic infections of wounds which, prior to his time devastated the surgical wards of every hospital. We should also be told that if the antiseptic did not completely sterilize the wound it would kill a large number of the microbes and inhibit the growth of the survivors.

Such an answer would betray loose and inconsequent thinking and a reluctance to come to close quarters with the question.

Lister's name is associated with two discoveries: First, that we can, by "anticipative prophylactic application" keep microbes from urgical wounds and so prevent infection. Second, that in cases of ompound fracture, where the wound is already infected, we can, by retrospective application of antiseptics," stave off wound infection. either of these discoveries finds any direct application in connection ith prophylaxis or treatment of infections of projectile wounds. the ordinary compound fracture of civil life the microbes lie posed on the surface of the bone which has been thrust through e skin. In projectile wounds they are inaccessible; they have been rried deep down in the tissues and lie at the bottom of a torn and gged track which is blocked by blood clot and torn tissues.

Is there any reasonable prospect of sterilizing the wound by an pplication of antiseptics?

Pus which is brought into intimate contact with the antiseptic ight possibly be sterilized; but there is pus locked up in blind alleys d pockets out of reach of antiseptic washings. There is also infec-

tion of the granulation tissue, and the formidable difficulty is that of penetrating power to deal with the sheltered microbes. There is not, among all the antiseptics, one which can penetrate into and sterilize the walls of an infected wound, nor is this a matter for surprise, for the granulation tissue is composed of continuous layers of cells; the cell wall is a quasi impenetrable membrane; there is a well-developed system of capillaries capable of absorbing and carrying away any antiseptic that might penetrate; there is also an outflowing lymph current.

Is there, in point of fact, any ground for the confident belief that a reduction in the number of microbes, such as would be obtained by washing out the wound with antiseptics, must carry advantage to the patient?

It is a firmly established conviction that a procedure which leaves in the wound fewer microbes will reduce the ultimate crop and so be of advantage to the patient. The bacteriologist does not see that this is a matter of course. He thinks not only of the sowing but of the soil, and knows that after a short time the lightness or heaviness of the sowing would be of little account. Whether few or many serophytic microbes are left behind in the wound will make little difference to the number found in the uncorrupted lymph. The important factor will be the rate at which the lymph becomes corrupted, and what is really important is not to thin out the microbes but to keep down their numbers.

What conclusions can be drawn from the fact that frequent re-dressings are indispensable in connection with the treatment of infected wounds by antiseptics?

When our treatment has miscarried and the wound has filled up again with pus, and this has become tryptic and has begun to digest the granulations and skin surfaces with which it comes in contact, and when bacterial poisons are being absorbed into the system, we are compelled to re-dress the wound. In other words, we have to try to get back to the position which was reached at the previous dressing. It is one thing to be able, when unsuccessful, to fall back upon dressing and to make this a point of new departure for trying a new way, but quite another thing to accept dressing as a necessary and inevitable element in our program of treatment, and then not even to propose to make it a point of departure for a new therapeutic effort, but calmly to contemplate an everlastingly repeated setting out into a blind alley and an everlastingly repeated return to the point from which we started. It should be clear to us that to make constant re-dressing an indispensable element in our treatment is as much a confession of failure in the case of an infected wound as in a surgical operation.

TREATMENT BY PHYSIOLOGICAL METHODS.

In treating a wound by physiological methods we follow the lead of he surgeon, but may hope to improve on his methods. It is a curent opinion that to abandon antiseptics would be equivalent to abanoning the program of killing microbes in the wound; but nature has, rom the very beginning of things, brought to bear her own antibacerial agents and antiseptics are only a recent substitute for these. The surgeon, in treating wounds, has all along unconsciously been bringing the antibacterial agencies of the body to bear on the infectng microbes. The chief points which the surgeon has insisted upon re the following: An abscess sac or closed cavity containing pus must e opened at the most dependent part and an outlet for the discharge rovided. Diffuse infection must be freely opened by incisions exending through to sound tissues in all directions and hot fōmentaions should afterward be applied. When amputating through inected tissues unrestricted drainage must be provided, either by leavng the wound unsutured or by reverting to the medieval method of utting the limb squarely across and dispensing entirely with flaps.

Opening the abscess sac not only removes the infected discharges, also leads to the destruction of the microbes which are embedded the walls. In the unopened abscess the antibacterial agencies of e body are overcome by the mass effect of the bacteria. In the pened abscess the bacteria are overcome by the mass effect of the ntibacterial agencies of the body; fresh lymph is streaming through he walls and active leukocytes are emigrating into the cavity. But pening the cavity does not always extinguish the infection and then is necessary to bring the antibacterial agencies into more effective peration. Certain supplementary surgical procedures contribute the accomplishment of this end, such as drainage tubes and hot mentations. The outflow of lymph may be greatly increased by ot fomentations and by the introduction of ether into the wound; it best of all, because it renders the lymph incoagulable, is a 5 per nt solution of sodium chlorid containing one-half per cent of dium citrate.

Once we have learned exactly how to control the outflow of lymph, d to control emigration and phagocytosis, it will be possible to end wound infection and to close the wound. It will always be imssible to sterilize a wound in a few minutes. We shall always have allow time for phagocytosis and digestion of the microbe and for mph lavage. Our best treatment will perhaps take the form of ntinuous irrigation or continuous baths.

Vaccine therapy is an effort to reinforce the antibacterial agencies the body and must always be merely an auxiliary to the methods

mentioned. By it we seek to increase the bacteriotropic power of the blood and to modify the chemiotropic sensibility of the leukocytes.—(L. W. JOHNSON.)

DELÉPINE, S. **On the prevention of "frostbite" and other effects of cold ("Froidure" or "Frigorism").** Jour. Roy. Army Med. Corps, London, xxiv, No. 5. May, 1915.

From elaborate physical experiments the investigator determined that frostbite could be prevented by the use of very thin soft oil-silk bags with apposition seams for foot and leg covering to be worn inside the woolen socks. These leg bags are inexpensive, durable, impermeable to water, and weigh less than 4 ounces per pair; two pairs are desirable for each soldier in order that one may be repaired when necessary with a thin application (preferably in a warm room) of boiled linseed oil and turpentine.—(C. N. FISKE.)

MOORE, J. E. **Operative treatment of bad results after fracture.** Surg., Gynec. and Obst., November, 1915.

The author states that the two great misfortunes that may follow a fracture are, first, nonunion, and second, deformity accompanied by disability. Our ideas concerning the causes of nonunion have been materially changed within the past few years. We have learned that syphilis is not so frequent a cause as we formerly believed. Dr. Abbott, of St. Paul, recently reported a series of severe fractures among a group of miners, most of whom were suffering from syphilis, and there were no cases of nonunion. Age was formerly believed to be a frequent cause of nonunion, but the fact is that the most cases of nonunion are in persons in middle life, youth and the elderly being comparatively exempt. This mistake was doubtless due to the fact that fracture of the neck of the femur, which occurs most frequently in the aged, was so commonly followed by nonunion. Within a few years, however, we have learned that the reason for nonunion in these cases was that the fragments were not brought in apposition by our former methods of treatment, and that when the fragments are brought in apposition by modern methods of treatment they unite in the majority of cases. We also learned that, contrary to our former belief, fracture of the neck of the femur is quite common in youth and childhood. Nonunion in these young people is practically unheard of, because the fracture is usually of the "green-stick" variety and the fragments are not separated. Many of the cases of coxa vera are really cases of unrecognized fracture of the neck of the femur, which have united in a faulty manner for lack of proper treatment.

Doubtless many cases of nonunion have been due to the presence of
uscle and other tissues between the fragments. In other words, the
acture has not been properly reduced. At the present time, by the
e of the X-ray, we can learn to a certainty when the fragments do
ot come in contact, and when they can not be brought in proper rela-
on by manipulation we adjust them through an open wound. There
therefore no longer excuse for nonunion due to improper adjust-
ents of the fragments.

There remains unfortunately a large number of cases of nonunion
or which the surgeon is in no way responsible and for which until
ery recently he has been able to do very little. These cases occur in
ersons who, for reasons that we do not understand, have not the
ower of producing osteoblasts, and no matter how well the frag-
ents may be adjusted nonunion will follow. The patient may be,
d usually is, a healthy individual, for fractures usually occur in
ealthy persons; he may not be suffering from syphilis nor any consti-
tional disease and may not be addicted to the use of alcohol, and yet
unable to produce new bone cells. It is in this class of cases that
have so often failed to secure bony union by operation. It is
terly useless to apply a Lane's plate, for that hinders rather than
omotes the production of osteoblasts. Wiring is equally inefficient.
rtunately we are now able to secure bony union in a large per-
tage of these cases by the use of the bone graft. The graft is
lieved by some surgeons to have osteogenetic properties of its own,
cause instances are on record in which the bone graft has been
oken and afterward united. The presence of the graft undoubtedly
mulates osteogenesis in the original bone. We have learned that
togenous grafts are the best and that grafts covered by periosteum
more quickly. While the part played by the periosteum has been
atly overestimated in the past, there seems to be no doubt but that
presence of periosteum on the graft aids osteogenesis. Whether
periosteum has real osteogenetic properties is still a disputed
stion.

here are three accepted methods of bone grafting: First, that
Buchanan, in which a piece of bone is removed from each of the
fragments, one long and the other short. The fragments are
transposed so that the long graft bridges over the seat of frac-
e. This is the method that the author recommends. He states
it is eminently satisfactory and that it can be done with the
let and chisel better than can either of the other methods. The
fts can be held in place by chromic catgut passed around the
e and tied over the graft, or by drilling a small hole transversely
ough each fragment through which is passed a strand of kangaroo
don to which is tied the grafts. This latter is Albee's suggestion.

The second method, suggested by Murphy, consists in reaming out the medullary cavity in each fragment and introducing the graft into these openings so that it extends beyond the area of eburnated bone in both fragments. The objections to this method are that the transplant must be comparatively small and is liable to be broken when the patient moves his limb, and it is also quite difficult to so adjust the transplant that it extends well beyond the eburnated bone in both fragments. This latter is absolutely necessary, because the eburnated bone has very little, if any, osteogenetic properties.

The third method of applying the bone graft is the favorite method with most surgeons, but requires the electric saw to perform it properly. It is performed by properly adjusting the two fragments, after which the periosteum is incised and turned back so that it can be stitched over the graft after it has been placed in the groove. Then, by means of an electric bone saw, with two parallel blades, two grooves are cut in each fragment. These grooves should extend into the medulla and beyond the hardened bone in each fragment. The bone between the grooves is then severed at either end by a chisel and removed, leaving a smooth-sided deep gutter. A strip of bone is then removed from the patient's tibia with the same saw and with the same adjustment, and placed in the gutter made in the fragments. Made in this manner the graft fits accurately, and can be held in place by closing the soft parts snugly over it, or by Albee's method without the necessity of introducing any unabsorbable material. The wound is then closed without drainage, and a plaster of Paris splint applied over the surgical dressings. Whenever practicable, it is very desirable to extend the plaster splint beyond the two neighboring joints, so as to prevent motion and strain upon the graft.—(A. M. F.)

ESTES, W. L. **End results of bone fractures.** Ann. Surg., September, 1915.

The author was chairman of a committee appointed by the American Surgical Association to investigate and report upon the end results of long-bone fractures. This committee communicated with a large number of representative surgeons all over the United States and examined the hospital and private records of 1,745 cases, of which 1,358 were nonoperative and 387 operative. Of this latter series there were 258 simple fractures and 129 cases of compound fractures which were operated upon.

The findings of the committee were as follows:

First. The results are best in the age period under 15 years. Conservative treatment is generally effectual during this period.

Second. Good anatomical restitution of a fractured long bone always results in the best functional result and has the shortest period of disability.

Third. While few open operations are reported under the 15-year ge period it seems to make little difference in the result, except in nile cases, what the age period is when the operation is done.

Fourth. The end results of operative and nonoperative treatment compound fractures show very little difference in the anatomical sult, but the functional results are better after operative treatment, cept in compound fractures of the shafts of both bones of the legs, ere the reverse seems to be true.

Fifth. The average period of disability (that is the time lost from ork) in simple fractures is as follows:

or fracture of the shaft of the humerus	weeks	14
or fracture at head and neck of the humerus	do	11.5
r fracture at condyle of humerus	do	9
r fracture of the shaft of both bones of forearm	do	10.8
r fracture of the femur, all sites	months	7.37
r fracture of the leg, all sites	do	4.75

Periods of disability were not recorded accurately nor generally compound fractures. In a series of 51 cases the average period of sability was:

	Months.
fracture of the femur	13
fracture of the leg	6
fracture of the upper extremity	4

Sixth. The humerus should not show more than 1 cm. shortening d no appreciable angulation. Musculo-spiral paralysis should not ult. The forearm bones should show no appreciable shortening, d pronation and supination should be unhindered. Function should ways be good and no lasting pain result. Fracture of the shaft of femur should not result in shortening greater than two centiters, nor in a fixed position of angulation or rotation which will ct the joints and require new habits of balancing or tilting of pelvis, and joint function should be good. No permanent disaty of the affected member should result. Fracture of the shaft of bones of the leg should result in no appreciable shortening and ngulation. Joint function should be preserved.

eventh. There is no method or splint universally applicable, nor any given splint or apparatus proven its superiority. All ends upon the discrimination of the surgeon and the manner in ch the apparatus is applied and maintained.

is evident that traction methods are most unskillfully employed. rule, too little weight is used. *The gage of the proper weight ired is that necessary to overcome the shortening.* This should determined by careful daily measurement. Traction methods ire, as a rule, countertraction. Plaster casts and molded splints especially indicated and useful after a fracture has been satisfacy reduced.

RECOMMENDATIONS.

1. The committee recommends as a general principle that fractures be treated by a skilled surgeon.

2. X-rays should be employed by a competent radiographer, or a fluoroscope should be used for diagnostic purposes before the permanent dressing is applied. At least two skiagrams should be taken, and they should be taken from opposite perpendicular directions. Skiagrams should also be taken after permanent dressings are applied to prove proper reduction, and at the end of the treatment to show the result of the union and for the purpose of graphic record.

3. Fractures should be reduced immediately after the injury, if possible, to obtain and apply proper retaining apparatus or splints. The statistics show markedly better results when the treatment is begun at once. It is, however, not only useless but cruel to subject the patient to the pain of manipulation for reduction unless the surgeon has proper fixation apparatus at hand and the patient is where he may have a permanent dressing applied.

4. General anesthesia should be employed as a rule to facilitate reduction and prevent pain, unless the condition of the patient contraindicates it.

5. Neither the nonoperative nor operative method is to be recommended exclusively. Each has its indications and should be employed when required. Generally speaking, the age period under 15 years is the period in which nonoperative methods are especially effectual. In the other age periods up to 60 years operative methods may with confidence be employed when nonoperative treatment has proven ineffectual in reducing, or controlling, the fragments in proper position. The operation should not be delayed more than a week after injury.

6. The open method when adopted should be employed early. It may be used at any age period, except in senile cases, whenever a skiagram shows a deformity or a position of the fragments which obviously can not be reduced, or when proper efforts at reduction and retention have proven unavailing.

7. Some form of rigid plate applied directly to the bone or an Albee "inlay" seems to be the best fixation method in operative cases.

8. Open operations for simple fractures should be undertaken only by experienced surgeons who are thoroughly equipped by training and who have proper instruments and apparatus to meet all the possible indications of the operation.

9. The work of this committee has been greatly hampered by the inadequacy of the records submitted for its consideration. A large proportion of the cases had to be rejected entirely, and most of them were so incomplete as to make deductions based upon them possibly misleading.

The committee strongly urges the American Surgical Association to set its seal of approval upon the standard form of record submitted by the committee and to further petition the American Medical Association to do the same. The committee also urges each member of the association faithfully to keep these records in his practice and to see that they are kept in the hospitals to which he is attached.—(A. M. F.)

HUNTINGTON, T. W. **A review of the literature of fractures.** Ann. Surg., September, 1915.

The author mentions the difficulty encountered in preparing such an article on account of the poor statistics and histories kept by surgeons of their cases of fracture. The different opinions regarding the best treatment are noted and many well-known authorities quoted.

Literature covering the past 10 years was studied, with the following conclusions, which are quoted verbatim:

First. The public demands, and is entitled to, better results from fracture treatment than have hitherto been obtained.

Second. That from 80 to 90 per cent of long-bone fractures can be successfully treated by the closed method.

Third. That conservative treatment exacts a high degree of skill and close attention to details.

Fourth. That resort to the open method is of too frequent occurrence.

Fifth. That the least possible amount of foreign fixation material should be the rule.

Sixth. That steel plates, in the treatment of fractures, are a menace from the standpoint of permanency.

Seventh. That the bone implant is the fixation material of choice.

Eighth. That intramedullary splints are inferior to the autogenous bone implant.

Ninth. That fixation material, of whatever type, is not to be relied upon for maintenance of alinement.

Tenth. That cases of nonunion and faulty union which come to secondary operation indicate indifferent methods of primary treatment.

Eleventh. Operative treatment of compound fractures should be withheld until the external wound healing is perfected.

Twelfth. Many joint fractures can only be treated successfully by the open method.

Thirteenth. That normal contour and good function are closely related in end-results of all fractures.—(E. H. H. O.)

LAW, A. A. The clinical status of the autograft. Ann. Surg., November, 1915.

The author has condensed in a short article what is being accomplished along this line at the present time. While much of the work mentioned is well known, still there are some new features worthy of review.

Mention is made of the fact that alien or heteroplastic transplantations are never successful, while there is still some dissent regarding homotransplants. The ideal is the autograft. The more complex the cells the less are their chances for survival, such as nerves, muscles, or parenchymatous cells, while the simpler tissues retain their vitality, such as fat, fascia, and tendons. The simpler tissues receiving temporary nutrition from the plasma by osmosis can survive until their blood supply is reestablished, while the complex tissues need immediate blood supply.

An aseptic field and sterile plasma are necessary for successful transplantation, although bone and fascial grafts show marked resistance to sepsis. Blood clotting about a graft is a serious mechanical interference, therefore absolute hemostasis is imperative. An exacting technic is required, one that forbids contact of gloved fingers with wound, transplant or working ends of instruments.

The different theories regarding bone regeneration when the grafts are with or without periosteum are mentioned; also that small grafts, with or without periosteum, will survive, and that 41 per cent of large grafts without periosteum lived, while 100 per cent of the grafts with periosteum were viable. In two cases bone transplanted into an old infected field survived. Lewis and others are transplanting autografts into cases of osteomyelitis with success. For the repair of nonunited fracture there are two methods—inlay or intermedullary insert—each has advantages, although there is 100 per cent of success by either method properly used. A few surgeons have abandoned the use of the Lane plate, using instead the autogenous bone inlay; the advantages of bone over metal are obvious.

Equally brilliant as in the transplantation of bone are the results from fascial grafts.

This tissue, also of the connective-tissue group, is used in many ways. Lined with fat the author has used it to fill in a 4-inch defect in the dura; the fat against the pia forms a hygroma and prevents dense adhesions.

An entire extensor group of tendons in the forearm was reconstructed from the iliotibial band, and a new annular ligament being formed from a fascia and fat fillet to prevent adhesions, with perfect functional result.

Excellent results were obtained in strengthening large ventral hernias by fascial grafts.

Free fascial grafts to cover the suture lines in esophagus, stomach, and bowels have not the merit of the omental graft of Senn. The occlusion of the pylorus by a fascial band is as satisfactory as any method, except resection.

Tubes of fascia connecting ends of a nerve have proved as successful as transplantation of segments of other nerves.

Murphy has popularized the use of fascial and flat flaps in reconstruction of joints. While the free graft is successful in the temporomaxillary, shoulder, elbow, and wrist joints, it should be displaced by the pedicled flaps in the weight-bearing joints.

Tendon transplants are well known. Fascia is fully as useful, but should tendon be desired the palmaris longus is easily available.

Free fat is readily transplanted and is useful in restoring contours in the face, breast, and eye sockets. The author has found it useful to prevent readhesions by tucking it under scars which have been bound down. In a case of severe burn of lower limb with marked scar formation and flexion of leg on thigh, after the scar tissue was dissected away and leg straightened the exposed vessels and nerves in popliteal space were covered with fat flaps with very successful result.

Nothing new is offered in skin grafting. Homotransplantation is believed to give as good results as the autograft.

Mucous membrane is rarely used, except occasionally in mouth and conjunctival sac.

Lexer reports success in using the mucous lining of the appendix (muscle and serosa removed) to form a new urethra.

The resected cecum and attached appendix have been used to form new bladder and urethra in case of exstrophy of bladder.

Transplantation of glandular organs is not successful. Homografts of thyroid glands are not successful. Organo-therapy has to be used instead.

Tuffier's work in ovarian transplantation has proven that the homografts are failures; he asserts as well that reimplantation after total hysterectomy is useless; however, his results in reimplantation where the uterus was not removed were brilliant, the patients being spared artificial menopause.—(E. H. H. O.)

ELIOT, E., Jr., and JAMESON, J. W. **Mesenteric thrombosis.** Ann. Surg., November, 1915.

Attention is called to the fact that the main artery supplying a segment of intestine is usually an end artery and that the corresponding vein, if obstructed, is without sufficient collateral circulation. Only in the arcade is there adequate collateral circulation.

The most frequent causes of this condition are:

(1) The occlusion of a large mesenteric artery by the lodgment of an embolus of cardiac or arterial origin, or from some distant focus of infection.

(2) The occlusion of a large mesenteric artery by the formation of a thrombus *in situ* either from the erosion of the arterial wall or from trauma.

(3) The occlusion of a large venous trunk by the formation of a thrombus due to the erosion of a chronically inflamed intima; to the extension of a small infected thrombus in a portal radical, most commonly associated with acute inflammation of the appendix; to the presence of adventitious toxins in various infectious processes, or to the disorganization of the blood associated with the severe anemias, diabetes, and with the latter stages of the wasting diseases.

In many cases no adequate cause can be discovered. In the obscure cases Reich suggested that thrombosis results from absorption of toxic material by the lymphatics, this passing to the lymphatics of the venous wall and indirectly causing coagulation of the blood. The author advances the theory that "there may be an intimate relation between abnormal intestinal fermentation and the subsequent absorption of the resulting chemical products by both the lymphatic and venous radicals, leading on the one hand to peritoneal adhesion with the formation of adhesions and on the other to the possible but rare coagulation of venous blood." This theory is considered as explaining presence of adhesions in cases with no history of prior peritonitis.

The superior is more often involved than the inferior mesenteric artery.

Clinical symptoms are grouped with difficulty. In some cases invasion is sudden, with evidences of extreme shock; in others, where the thrombosis is slow, the invasion is gradual.

After analyzing 262 cases, Reich made two groups:

(1) A group characterized by the classic symptoms of acute intestinal obstruction, in which there is acute circulatory disturbance—pain, vomiting, and complete constipation being especially prominent symptoms.

(2) A second type, in which the pain and vomiting are associated with the occurrence of repeated watery stools, occasionally containing blood.

Reich states that diarrhea occurs in 41 per cent of cases, in 26 per cent the stools contain blood, and in 16 per cent the vomitus contains blood.

The physical signs are chiefly the result of peritoneal irritation. They comprise diminished respiratory movement of the abdominal wall, rarely visible peristalsis, rarely localized meteorismus, usually

localized tenderness, and the all-important symptom of muscular rigidity, which is apt to be more diffuse than localized. In the acute type the rigidity will obscure any tumor, but in the subacute type a tumor is occasionally felt. There may be enough fluid in abdomen to give a dull note. As the affected loop often lies in the pelvis, a rectal examination is often of assistance. An increased leukocytic count is usually obtained in both general and polymorphonuclear count. Together the physical signs are those of a spreading peritonitis, resembling an infected appendix, a duodenal perforation, an infected gall-bladder, or an acute pancreatitis.

Treatment.—Operation is indicated in all cases uncomplicated by serious or advanced associated visceral changes. The presence of diffuse and persistent abdominal rigidity warrants prompt exploration. On opening the abdominal cavity the presence of a dark-colored if not actually bloody fluid shows that usually some form of intestinal obstruction due to circulatory interference is present. The incision should be enlarged to allow exploration of the entire intestinal tract. At times it is hard to determine the limit of involvement, as the color changes are not always marked and glistening of serous coat may remain for some time. On this account some observers prefer postponing operation two or three days, but the authors consider this inadvisable.

Resection of the affected intestine, followed by restoration of the continuity of the intestinal canal by end-to-end anastomosis or lateral anastomosis when ends of unequal caliber as between large and small intestine or when one or both are edematous, is the treatment of choice. If the patient's condition does not warrant a prolonged operation, the divided ends, after removal of the necrotic intestine, should be left in the wound and anastomosis done at a later date.

Reich has grouped the conditions which preclude the possibility of successful resection as follows: (1) Portal thrombosis; (2) multiple infarcts; (3) infarcts of the descending colon and sigmoid; (4) extensive infarcts, including those with no sharp line of demarcation. Several cases of the authors are quoted.—(E. H. H. O.)

HYGIENE AND SANITATION.

. FISKE, Surgeon, and R. C. RANSDELL, Passed Assistant Surgeon, United States Navy.

HER, H. C. **Hygienic interpretation of recent changes in the field rations and their preparation.** Tr. 15th Internat. Cong. Hyg. and Demogr., Washington, V, sec. 8, pp. 834–838.

The present garrison and haversack rations of the United States Army are discussed. In the author's opinion they are more satisfactory than the type of rations hitherto supplied.

The garrison ration, according to the components selected (and there is considerable range of choice in all the principal articles), will furnish from 5,500 to 5,674 calories. The haversack ration will furnish, it is assumed, 113 gm. proteid, 218 gm. fat, and 489 gm. carbohydrates, with a total fuel value of 4,448 calories.

The haversack ration consists of meat or bacon with other foods, the haversack utensils giving an opportunity to cook the bacon.

"The hard bread furnished for the haversack ration, and formerly our main dependence for field use, is excellent within its limitation, but lacks a pleasing taste, palls upon the appetite, and undoubtedly tends to gastro-intestinal complaints on account of its hardness."

It is the author's opinion that "the recent improvements in the field rations and means of preparing them provide a dietary for soldiers that leaves but little room for improvement. While the haversack ration is somewhat meager, the provision for supplementing it affords a sufficient but not an excessive amount of nourishment. It is a wise provision that supplies young men undergoing the necessary exertion and hardship of a soldier's life with an abundance of wholesome food, and a large experience of practical life has demonstrated that this class of men requires the ample food supply provided."

Information is given regarding the emergency ration, which weighed 8 ounces and consisted of chocolate liquor, nucleo-casein, malted milk, egg albumen, powdered cane sugar, and cocoa butter. It furnished 52 gm. proteid, 72 gm. fat, 110 gm. carbohydrates, with a (fuel) value of 1,334 calories. The ingredients are compressed into 3 cakes resembling a chocolate confection and inclosed in a sealed tin can. It is pleasant to the taste and may be eaten without further preparation.

"There seems to be considerable question about the desirability of an emergency ration, and the equipment board recommended that an additional haversack ration be substituted for the emergency ration now carried by each soldier in campaign."—(E. W. BROWN.)

STILES, P. G. **Recent additions to the conception of a normal diet.** Interstate Med. Jour., xxii, No. 10, October, 1915.

The author reviews the facts that besides certain proximate principles in diet essential for maintenance, growth, and well-being of man there are also required certain mineral salts and a solvent; the alimentary "elements must be supplied in the form of compounds not too radically unlike those of the tissues to be nourished," digestible and appetizing. The functions of alimentary elements have been generally understood.

has gradually been comprehended, however, that the alimentary ins vary widely in their availability for the needs of the human ism, a smaller amount of those from meat, milk, and eggs suf- than from cereals, legumes, etc. Gelatine was known to be g in some element essential to nutrition.

digestion of proteins is a matter of cleavage of complex mole- as in the carbohydrates, and their latest order consists of the -acids, of which about 20 have been identified; these acids are lered the building stones of the tissues and must be present in ity as well as sufficient variety; gelatine, for example, lacks one o of these "building stones," as do numerous other proteins, ularly from vegetable sources.

ndel and Osborne, of New Haven, have effected such precision eir work with the purified proteins from many sources that how which and in what quantities sustain both life and growth administered with carbohydrates and mineral salts, and which rt life but not growth; certain proteins, like gelatine, main- either. Working with small laboratory animals and from y, making due allowance for variation in longevity, it should sible to arrest development in man to the age of 40 years and fter develop adult stature.

natural varied diet these observations are of little or no con- ce, except to show that variety is necessary and that, for ex- vegetarianism may be carried too far. Lusk cited the experi- of Thomas that while 30 grams of meat protein would main- quilibrium, there would be required 31 grams of milk protein, ams of rice protein, 38 grams of potato protein, or 54 grams tein from beans; the maximum protein was 102 grams from corn. These figures will show the inefficiency of certain foods so explain why rice is relatively efficient for such a proportion world's inhabitants.

and carbohydrates, of course, serve nearly the same purposes e nearly mutually interchangeable; experience with diabetics own that fat oxidation is not always complete in the absence bohydrate oxidation, although the manufacture of sugar from (body protein in diabetes) is capable of preventing acidosis, e case of Esquimaux.

ough fats and carbohydrates are usually considered of fuel only, they may serve for growth, as has been found, notably utter fat as compared with fat from other sources.

actives are now found to have a far more important and vital n than that of appetizers, secretagogues, and nerve regulators; sence gives rise to the so-called "deficiency diseases," as the ine" lacking in beriberi, which may be supplied from meat,

potato, yeast, and the pericarp of rice. Scurvy is thought to have, or rather lack, its own vitamine.

Stiles aptly declares that the function of vitamines in the organization of protoplasm is analogous to "that of the bolts and rivets in a mechanism. They are a small fraction of the whole, yet its integrity depends absolutely upon them"; they are well named, the presence of those amines being vital; they are "closely comparable" with the mineral salts and internal secretions in nutrition. The empirical teaching of Sylvester Graham as to the use of unbolted flour is scientifically substantiated. "*Kind* as well as *quantity* of protein, *variety* as well as *amount* of the minor constituents, must always effect our judgment in any such comparison."—(C. N. F.)

THE ILLINOIS STATE BOARD OF HEALTH. **Removing diphtheria bacilli with kaolin.** Illinois Health News, I, No. 8, August, 1915.

Referring to the expeditious success of Hektoen and Rappaport in eradicating bacteria from the throat and nose by the insufflation of kaolin powder into the nose six or seven times a day and swallowing slowly one-third of a teaspoonful of the powder four or five times an hour, this bulletin emphasizes the importance of utilizing this means for shortening quarantine periods and eliminating diphtheria carriers; not only are diphtheria bacilli removed but practically all bacteria [doubtless meningococci] were destroyed in three or four days. * * * Strumpf believes that it acts by depriving the germs of suitable soil in which to live while mechanically burying them alive. [In emergency, in the absence of kaolin (aluminum silicate) doubtless talcum (magnesium silicate) would be efficacious.]—(C. N. F.)

TROPICAL MEDICINE.

E. R. STITT, Medical Director, United States Navy.

STRONG, S. B., and LEBREDO, M. G. **Bilharzia in Cuba.** Sanidad y Beneficencia. xiii, Nos. 1, 2, and 3, 1915.

Three cases of bilharziosis are described which were seen at Preston by Dr. Strong, of the medical department of the United Fruit Co., stationed at Nipe Bay. They are stated to be the first cases of the disease seen in Cuba. One was of the urinary and two were of the intestinal form.

Case 1.—A Jamaican negro, aged 20, admitted with symptoms of tertian malaria and having no hematuria or other evidences of schistosomiasis. Examination of the urine showed the ova of *Schistosomum hematobium* and many living miracidia. It was noted that after ad-

ministration of hexamethylenamin the miracidia were always dead. Further observations were prevented by the refusal of the patient to undergo treatment.

Case 2.—A Jamaican negro, aged 23, was admitted with chills and fever. Examination of the feces showed the ova of *Schistosomum mansoni.* Treatment was unsuccessful, and he was still discharging ova when he left the hospital.

Case 3.—A Spaniard, aged 27, was admitted with malaria and had also a periodical diarrhea. Examination of the feces showed the ova and miracidia of *Schistosomum mansoni.* One treatment of oil of chenopodium was given, and the ova disappeared from the stools.—(L. W. JOHNSON.)

SHIVERS, M. O. **Pellagra a curable disease.** Colorado Med., September, 1915.

While pellagra is of undetermined etiology and may be due to dirt, water, or insects, one feature stands out, however, namely, that the seasons of the year have great influence on the course of the disease. The manifestations are so varied and any one particular symptom may become of such major importance as to confuse in the early stages of the disease.

The skin lesions carry the patient to the dermatologist, the gastrointestinal manifestations engage the gastroenterologist, the throat phenomena bring the patient to the laryngologist, the pathology of the nervous apparatus forces the neurologist into action, while abdominal pain and soreness bring the sufferer to the surgeon. Severe mouth symptoms may even bring the patient first to the dentist.

The author reports intimate study and treatment of 68 cases, most of them bad mentally and physically. There were 3 deaths, which is considered very low.

The treatment was as follows: The first step in the treatment consists in putting the patient to bed in a cool, dark room and keeping him there until symptoms are under control. All patients, however mild the symptoms, should be kept in a dark room for from two to three weeks. If all pellagra patients were treated as seriously ill individuals, and truly they are, end results would be much more satisfactory. The most severe type must be kept in a dark room from three weeks to months if necessary. Patients are permitted, when convalescence is established, to be up after sunset and about in the evenings, and when they are able to go in the sun broad-brim hats and white gloves are worn. If they are very ill, nothing but fruit juices are given, particularly carbonated apple juice, pineapple juice, and orange juice. Later vegetables such as lettuce, spinach, and tomatoes are given. Then, as the patient's stomach permits, soft eggs, buttermilk, meats, baked apples, and

calf's-foot jelly are added. Give no starches or sugars for the first 8 or 10 days, then begin with zwieback, later bread and potatoes. So many articles of diet contain cornstarch that strict vigilance must be maintained if results are to be obtained. A system free from cornstarch and sugars has the best prospect of cure. Quietude should be maintained. Sleep is essential, and this is best accomplished by the administration of veronal and paregoric. Where the patient's nervous symptoms predominate, sodium bromid is given. Pain is best controlled by aspirin. For the mouth, washes of permanganate, formalin, and carbolic should be alternated hourly while awake. If the teeth are very loose they should be extracted. Vomiting is controlled by fruit juices, loose bowels by bismuth, hydrastis, and paregoric. For elimination, weekly doses of castor oil as well as daily rectal irrigations of saline are given. In females, daily douches of salt solution are added. Castor oil is given in smaller doses and more frequently when there is a tendency to diarrhea, paregoric being always added. Eruptions of the skin are treated by oxid of zinc and lanolin, keeping the parts well protected. Climate will check the progress of the disease but not cure it. This has been demonstrated by permitting the case to go untreated except by climate, to see all the symptoms disappear but have the patient return the next spring with all the symptoms reestablished.

Arsenic is put forward as a specific that will cure and keep cured if used in conjunction with the above-mentioned efforts to improve environments and diet. The stomach is not in condition to receive arsenic, so it must be administered hypodermatically or intravenously. The dose must be carefully regulated. The best results have been secured by giving sodium cacodylate under the skin in the following manner: Begin with three-fourths grain daily for six or eight days, then 3 grains every second or third day for several weeks, gradually increasing the dose to 7 grains weekly.—(E. THOMPSON.)

SANDWITH, F. M. Pellagra. Lancet, London, Oct. 23, 1915.

The author first discusses the chief theories as to etiology. As regards Sambon's views as to protozoal origin and transmission by Simulium, he notes that there is now no more evidence that pellagra is insect borne than there was when Dr. Sambon first suggested the theory in 1905.

In discussing Alessandrini's theory that the disease is caused by colloidal silica, the source being the water from argillaceous soils, he notes that while some soils contain 35 per cent of alumina, yet in Egypt, where pellagra is common, the alluvial soils only show about 15 per cent of silica. He further notes that the water of Egypt does not come from "clayey districts."

It is interesting to read that Dr. Sandwith, while on a visit to America in 1905, discovered a case of pellagra, but the patient proved to be a recent arrival from Italy.

As the result of reading Braddon's book on the relation of rice to beriberi, it occurred to the author that pellagra might be due to some dietary deficiency connected with maize, and he began to think that pellagra might not be caused by what a man eats but by what he fails to eat.

Dr. Sandwith gives much space to the work of Goldberger and his colleagues in their investigation of the relation of improper diet to pellagra.

There is a paragraph dealing with the connection between pellagra and ancylostomiasis. In this connection he notes that he examined 300 patients who were being treated for hookworm disease at a hospital in Old Cairo. Of this number there were 138 who were positively pellagrous—46 per cent.—(E. R. S.)

BOND, H. E. **Causation and treatment of pellagra.** Jour. Trop. Med., Oct. 15, 1915.

The author after a discussion of the sympathetic nervous system and the chromaffin cells states that whatever may be the toxins in the gastrointestinal tract they act on the sympathetic nervous system in the intestines and then on the chromaffin cells and tissue leading to pigmentation and nervous manifestations. He notes that in Addison's disease the pigmentation is simply an exaggeration of pigmentation of areas showing this normally. In pellagra he thinks the actinic rays of the sun may act as an irritant on skin when vitality is lowered from defective nerve innervation.

He regards pellagra as a disease akin to Addison's disease.

NOTE.—Finotti and Redeschi, in 1902, noted chronic inflammatory changes in the adrenals in 10 autopsies.—(E. R. S.)

WOOD, E. J. **The occurrence of sprue in the United States.** Am. Jour. Med. Sc., November, 1915.

The author notes that in 1905 and 1907, cases diagnosed as sprue were reported in patients from Georgia who had not lived in the Tropics. It is also noted that certain of these cases reported by Harris may have been pellagra, but others were undoubtedly sprue.

As regards the reduction in the size of the liver, Wood states that this occurs in pellagra as well as in sprue. He also states that salivation, so prominent a symptom in pellagra, is not mentioned in sprue literature. (In this connection it may be noted that Scheube

states that a flow of saliva may occur in sprue with or without involvement of the parotid gland.)

The author in stating that sprue is a disease most frequently confused with pellagra notes that in America there is a tendency not to make a diagnosis of pellagra without skin lesions or a history of a past attack. In reviewing several hundred of his cases with symptoms pointing to pellagra he notes that a considerable number of such cases never developed the symptoms necessary to a conclusive diagnosis. He states that a large part of these cases suffered from tropical sprue, which was formerly thought not to occur in the United States.

It is stated that pellagra has as great a tendency to attack the nervous system as has syphilis, and the writer thinks that it is in the absence of organic changes in the nervous system in sprue that we have our best differentiation from pellagra.

As regards the stools it is stated that in pellagra these are more fluid, darker in color, not limited to the morning hours, and attended with more or less mucus and tenesmus, while in sprue the stool is more copious, quite light in color, acid in reaction, and gas permeated.

The most important differentiation, however, is in the fat loss. In pellagra this is normal, while in sprue it is notable. (Bahr states that in the normal individual the fat loss is only 5 per cent, while in his sprue cases it varies from 10 to 30 per cent.)

Wood states that a fatty diarrhea is the best single symptom for the diagnosis of sprue.—(E. R. S.)

PATHOLOGY, BACTERIOLOGY, AND ANIMAL PARASITOLOGY.

C. S. BUTLER, Surgeon, and R. H. LANING, Passed Assistant Surgeon, United States Navy.

CUSHING, H., and GOETSCH, E. **Hibernation and the pituitary body.** Jour. Exper. Med., July 1, 1915.

Observations on animals, following experimental hypophysectomy demonstrated that there was lowering of body temperature: shallow respiration: ratardation of pulse rate; lowering of blood pressure; insensitiveness to painful external stimuli and lethargy. In some animals, surviving partial removal of the glands, there was a tendency to become adipose, thus furnishing an experimental explanation of the clinical syndrome of dystrophia adiposogenitalis.

Clinical observations on patients having disease or tumor of the gland, or in the region of the gland, confirmed the experimental work. In one such case in man, implantation of the gland, taken from a still-born infant, caused astonishing improvement.

Studies were made on seven woodchucks, during and after the hibernating period. The pars anterior of the pituitary body, of those hibernating, showed marked changes from the normal; while in animals, after hibernating, there was a gradual return to the normal. In some of the animals there was also a study of other ductless glands, some of which showed alterations, but in none were the changes so profound and characteristic.—(G. F. CLARK.)

DOCHEZ, A. R., and AVERY, O. T. **The occurrence of carriers of disease-producing types of pneumococcus.** Jour. Exper. Med., July 1, 1915.

The writers refer to their previous papers, in pointing out that pneumococci, isolated from those suffering from pneumonia, may be divided into four groups. The first three groups of pneumococci are comprised of disease-producing races, and are responsible for 75 per cent of all cases of lobar pneumonia. Approximately 25 per cent of cases of pneumonia are due to the fourth group of organisms—which can not be distinguished from those dwelling in the normal human mouth.

Groups 1, 2, and 3 are recognized by their immune reactions. Group 4 consists of a heterogeneous series of strains which are not related antigenically.

Four tables are given. Table I shows that the duration of carrier state, in healthy individuals, in contact with cases of lobar pneumonia, is approximately 23 days. Table II shows that sputum from normal individuals contains no pneumococci in 48.6 per cent; pneumococci type I, in 2.6 per cent; pneumococci type II, in 7 per cent; pneumococci type IV, in 41.6 per cent. Table III shows type of pneumococcus isolated from cases of lobar pneumonia. Type I in 34.97 per cent; type II in 33.63 per cent; type III in 9.86 per cent; type IV in 21.52 per cent. Table IV shows persistence of disease-producing types of pneumococcus during convalescence—varying from 12 days to 90 days. A few showed no pneumococci 12 days or longer, after recovery.—(G. F. CLARK.)

FLEXNER, S. **The mode of infection and etiology of epidemic poliomyelitis.** Am. Jour. Dis. Child., May, 1915.

Of the two notable modes of infection advanced for infantile paralysis the insect host, suggested by Rosenau and supported by Anderson and Frost, has entirely failed of confirmation even subsequently by the two last-named investigators. The recognition of abortive and ambulant forms of the disease confirmed by laboratory findings

lead to the detection of the virus "on the nasal and pharyngeal mucous membranes, so as to make possible the communication of poliomyelitis to monkeys" and also its evident dissemination by personal contact. "Both healthy and chronic carriers of the microbic agent of infection" are few, but require preventive consideration.

The filterable virus was cultivated successfully by Flexner and Noguchi two years ago and by inoculation reproduced the disease in monkeys. Recently an eighteen-months'-old culture was revived in ascitic fluid and broth, and after repeated injections into peritoneum and spinal canal the disease was reproduced, giving clinical and histologic changes peculiar to poliomyelitis. The microbic agent consists of minute globular bodies, which must not be permitted to spread from the nasal mucous membranes of frankly ill, slightly ill, healthy, or chronic carriers to noninfected persons.—(C. N. FISKE.)

KENDALL, A. J., and WALKER, A. W. **Observations on the proteolytic enzyme of bacillus proteus.** Jour. Infect. Dis., xvii, No. 3.

The authors find that *B. proteus* produces soluble proteolytic enzymes in plain broth and gelatin. Filtration of cultures through Berkefeld filters secures the enzyme free from bacteria.

The enzyme, it seems, prepares protein for bacterial assimilation and has no rôle in the intracellular utilization of protein by the bacteria.

Liquefaction of gelatin by the enzyme does not liberate ammonia. This is an independent phenomenon accompanying the intracellular utilization of the products of proteolysis by the organisms themselves.

The enzyme does not appear where carbohydrates in usable form are present, but only where protein is being utilized by *B. proteus*.

Dextrose added to cultures of *B. proteus* prevents the formation of enzymes. Under these circumstances the bacteria act principally upon the carbohydrates.

Small amounts of dextrose prevent the formation of the enzyme until the dextrose is exhausted, when the bacteria having to act upon the protein of the medium form the enzyme.

Large amounts of dextrose (above 0.3 per cent), which can not be wholly utilized by *B. proteus*, permanently prevent enzyme formation. This probably is due to by-products from the dextrose, which prevent further growth.

Dextrose itself does not inhibit the activity of the bacteria-free enzyme. Dextrose gelatin is rapidly liquefied by it.—(C. S. B.)

Comparative efficacy of benzin and anisol for the destruction of parasites. Rev. d'hyg. et de pol. sanit., xxxvii, No. 6, June, 1915, p. 628.

Bordas and Letulle recommended the employment of benzin for destroying lice.

Anisol is also of use for the same purpose. This drug is a phenol methylate, $C_6H_5(OCH_3)$, which boils at 152° C., prepared by heating under pressure to 100°–120° a mixture of phenate of soda and methyl iodid.

To compare the efficacy of the two products, benzin and anisol, the authors have under similar conditions submitted body lice (*Pediculus vestimenti*) and head lice (*Pediculus capitis*) to experimentation.

The experiments showed that lice exposed to the vapors of these agents in test tubes with the mouths plugged have ceased to show signs of life after 2 minutes and 30 seconds in case of benzin and after 6 minutes in case of anisol. The insects are, however, not actually dead after exposure for the times mentioned. To insure death it is necessary to expose for 15 minutes in case of benzin and for 30 minutes in case of anisol. Benzin as an insecticide was superior to anisol, but has the disadvantage of inflammability, while anisol has the disadvantage of being very costly.—(C. S. B.)

JAFFÉ, R. H. **Technic for culturing typhoid bacilli from stools.** Wien. klin. Wchnschr., xxviii, No. 16, pp. 411–434.

The author speaks of the ease and reliability of Bierast's method of isolating *B. typhosus* and *paratyphosus* from the stools of carriers.

The method consists of mixing the stool with bouillon until of a pasty consistence, then pouring benzin over this and shaking thoroughly in a well-stoppered bottle. This mixture is set aside in a cool dark place for 16 hours (this delay is counterbalanced by the other great advantages of the method) and then plating two or three drops of the material upon Conradi's or other media for the culture of intestinal bacteria. The benzin seems to rob colon bacilli of some material essential for vigorous growth while not disturbing the viability of typhoids and paratyphoids.

Of 14 cases studied by this method 4 cases yielded positive results, which were negative by other methods. In 5 other cases the organisms were present in almost pure culture.

The author cautions against the danger of contaminating one's hands in the procedure.—(C. S. B.)

GOLDBERGER, WILLIAMS, and HACHTEL. **Report of an investigation of diphtheria carriers.** Hyg. Lab. Bull., No. 101, August, 1915.

The authors summarize the results of their work done in Detroit during 1913–14 in the following paragraphs:

1. Cultures from 4,093 healthy people in the city of Detroit were examined for diphtheria bacilli.

2. Thirty-eight (0.928 per cent) were found to harbor *B. diphtheriae* (morphological).

3. Of 19 cultures isolated from 19 of the carriers, 2 were found to be virulent, suggesting a possible 0.097 per cent of the individuals examined as carriers of virulent bacilli.

4. Comparison of the value of different types of single cultures for the detection of carriers shows that the throat culture gives the lowest, and the combined nose and throat the highest results. The latter, however, is but slightly higher than that from the nose alone.

5. The combined results of a throat and of a nose culture give markedly better findings than those of any single culture.

6. The combined results of a throat, a nose, and a combined nose and throat gave the highest findings, but this does not appear to be greatly superior to the two-culture findings.

7. All carrier cultures isolated, 19 in all, were found to be acid producers.

8. Twenty-nine of 30 cultures of *B. diphtheriae* from clinical cases were virulent and all 30 were acid producers.

9. Of 47 cultures morphologically of Hoffman's bacillus, 6 showed some acid production; 41 were alkali producers. All 47 cultures were avirulent.

10. Hoffman's bacillus was present in at least 41.9 per cent of 2,319 individuals.—(C. S. B.)

HONEIJ, J. A. **Leprosy—The presence of acid-fast bacilli in the circulating blood and excretions.** Jour. Infect. Dis., xvii, No. 2.

In this paper the author has made a systematic search in an attempt to analyze the cases occurring at the Penikese Leper Colony, Penikese Island, Mass., and to determine whether the acid-fast bacillus can or can not be found in the blood, urine, feces, sputum, nasal mucus, and other excretions and discharges.

In the blood, out of 28 examinations among 16 patients, there were 9 positive, 3 questionable, and 16 negative. This represents 8 patients with positive and 8 patients with negative results. In the urine, out of 41 examinations made on 16 patients, 16 were positive on 9 patients. In the feces, out of 27 examinations of 16 patients, 10 were positive in 6 patients. In the sputum, out of 41 results recorded among 16 patients, 32 were positive and 9 negative, 14 patients giving positive

and 2 patients negative sputum. In the nasal mucus, 16 patients with 41 examinations, gave 34 positive, 6 negative, and 1 questionable result; in other words, 14 patients had bacilli in the nasal mucus and 2 did not. Out of 15 patients that had bullae, ulcers, and pustules, those having bullae gave 5 results positive and 10 negative; ulcers, 13 positive and 2 negative; and pustules, 7 positive and 8 negative. In the examination of tears there were 26 negative results in 13 patients.

In his conclusions the author states that the occurrence of symptoms of toxic febrile attacks, etc., are more easily understandable when the fact is accepted that the bacilli are found in the blood stream and excretions. He also states that the presence of bacilli in the blood and in the various excreta, as determined, warrants the assumption that insect transmission is a possibility.—(R. H. L.)

NAKAJO, S., and ASAKURA, T. **The serologic diagnosis of leprosy.** Jour. Infect. Dis., xvii, No. 2.

The authors attempt to solve by experiment the following questions:

1. To what extent does the serum of a leper react in complement fixation with tuberculin, about which much has been written?

2. What relation does this phenomenon bear to the Wassermann reaction?

3. What attitude does tuberculin show toward nonleprous serum in regard to complement fixation?

4. Does or does not the leprous blood contain some antigens produced by the bacilli in the body? That is, may the blood contain such properties as have arisen from the bacilli themselves, or the products of the organic cells produced by the irritant effect of the bacilli?

5. Might the properties remain inactive in complement-fixation tests because of the immune properties produced by such antigens?

6. Will such properties be shown, as a result of comparative study, to be present in the blood of a patient suffering from diseases other than leprosy?

The authors give a summary of their conclusions as follows: "Our results in complement-fixation tests with leprous sera and old tuberculin, considered from the standpoint of the type of the disease, show that a higher percentage positive, i. e., 87.5 per cent was obtained in tubercular leprosy than was obtained in nervous leprosy—40 per cent. Classified according to the severity of the symptoms, these results are 89.48 per cent positive cases, severe; 55.56 per cent, mild; and 45.45 per cent, slight. From these facts

we may conclude that the reaction produced by old tuberculin bears a direct relation to the nature of leprosy, though, as Babes and Moller affirm, it is never specific. Moreover, the heart extract of a guinea-pig fay be substituted for it in the same way as in the Wassermann test.

"As Meier has pointed out, if there is any doubt as to the disease (whether syphilis or leprosy) from which a patient is suffering, it will probably prove to be leprosy if the complement-fixation tests with both old tuberculin and Wassermann's give positive results. If the test reacts positively only with old tuberculin, the disease is unmistakably leprosy; but negative results are not sufficient to exclude the case as leprosy.

"Although no differences occurred between the percentages of the positive cases in complement-fixation tests with leprous sera and either old tuberculin or leprous nodule, cases nevertheless occurred in which not only were the results obtained in both tests reversed but in certain syphilitic sera the leprous nodule antigen brought about a considerably larger number of positive results. This fact appears to us to be explained on the ground that these results are nonspecific in their nature, if the term 'specific' be applied in its wider sense, inasmuch as the heart extract of a guinea-pig can be said to produce a 'specific' reaction to syphilis. These facts led us to conjecture that this positive result may have been a reaction, not against the disease primarily present in the sera, but against certain other coexisting properties, a case in which the ratio of the genuinely positive results would have been less than that appearing in our table.

"The clot of leprous blood, the sera of which reacted positively, with leprous nodule antigen (leprous positive clot antigen), and the blood clot from a guinea-pig brought about identical results, as did the old tuberculin in complement-fixation tests with leprous sera; but we regret that they were tested in too few cases to enable us to draw any conclusions therefrom. The leprous negative clot antigen, which was obtained from the blood giving no complement-fixation with leprous nodule antigen, and the clot from a syphilitic patient, which gave negative results with the leprous nodule antigen, gave almost negative results, that is, identical with those produced in nonleprous (i. e., syphilitic) sera. It seems, therefore, that these antigens contain properties differing from those of the other two antigens. Closer observation, moreover, reveals the fact that there were some cases that gave a very slight positive reaction with leprous positive clot antigen, as well as with the negative clot antigen; for this reason we deem it necessary to continue the study of these two kinds of antigens."

e same authors in a sequel to the above article entitled: "Fur- observations on the serologic diagnosis of leprosy," give a iption of a further line of experiments which lead them to the ving conclusions:

n our first series, 69.23 per cent of the total number of cases positive results with old tuberculin. In this second series, 70 nt were positive—practically the same result. If we add these gures we find that 49 cases were examined in all of which 34, 38 per cent, reacted positively.

n the other hand 11 cases of syphilis and 4 other cases of non- s diseases, that is, 15 cases in all, gave negative results.

ne fact that old tuberculin reacts specifically with leprous serum nplement-fixation test has thus again been demonstrated.

irty-three cases of leprosy were examined by the Wassermann which 26, or 78.79 per cent, were positive. This shows that assermann test brings about a greater percentage of positive than does old tuberculin, for of the 9 cases examined with nds of antigen, only 7 produced positive results with the latter, ll of them were positive with the Wassermann test.

therefore, the serum of a doubtful case (whether syphilis or) produces positive results both with old tuberculin and the mann antigen the probabilities are that the patient is a leper. er, negative results with old tuberculin are not sufficient to a diagnosis of leprosy. On this occasion we observed no leprosy that reacted positively only with old tuberculin.

the 2,016 cases sent to the Government leprosoria as lepers were found by clinical observation to be syphilitic. Such an not be subjected to the usual Wassermann method of tial diagnosis, but the complement-fixation test with old lin as antigen will help greatly, for, although this is inert hilis and many other diseases, it will produce positive results e majority of leprous patients. The necessity of these meth- es from the difficulty which is sometimes met with in detect- germ by microscopic examination."—(R. H. L.)

. C. **The diagnostic value of the placental blood film in estivo-autumnal malaria.** Jour. Exper. Med., xxii, No. 4.

uthor in this article brings out the value of examining the l blood film in all cases, particularly of white women in -ridden districts. He shows how this procedure is particu- nportant in differentiating puerperal sepsis and estivo- l malaria. Dr. Clark has made a study of the malarial blood

in 400 cases of delivery in Panama and has made the following conclusions:

"1. The placental blood film-examination is worthy of routine application wherever estivo-autumnal malaria is endemic. This type of malaria, when associated with labor and the early days of the puerperium, can be more easily and certainly diagnosed by the use of this film and a polychrome stain than by employing the usual films made from the mother's peripheral blood at the time of labor.

"The placental film in such an infection offers an abundance of adult parasites and far more evidence of the presence of pigment. while the peripheral blood film frequently offers but a scant number of the small ring or discoid forms of a parasite. The examination of the present series revealed positive placental films in 19 cases, while but 8 of these same cases were positive in peripheral blood-film examination. On the other hand, no peripheral blood films were found positive in which the associated placental films did not reveal a far more abundant evidence of the infection.

"2. The early days of the puerperium can by this method be protected many times from a malarial outburst, and, as a rule. puerperal sepsis can be differentiated.

"3. The intricate vascular architecture of the mature placenta rivals that of the spleen, liver, and bone marrow as a harbor for adult malarial parasites of this type and as a storage for pigment.

"4. The localization of parasites in the placenta is unique. Here is the one vascular system which particularly favors the development of the parasites, but which at the same time is so situated that it may be spontaneously discarded by the body at the climax of the attack. By this simple act late in pregnancy the prognosis for both mother and child may be improved.

"5. The pregnant state encourages attacks of malaria by lowering bodily resistance and by furnishing an additional harbor for the development of parasites. A tenable theory in regard to most attacks of this nature, occurring in cases under professional care, would appear to be the development of latent malaria (malarial carriers) into acute attacks toward the close of the pregnant state. The women who expose themselves (as the negroes in this series) offer favorable conditions to the introduction of a primary infection.

"Malaria frequently interrupts the late stages of pregnancy and sometimes causes the death of the mother and the fetus, more often the latter. The records of Ancon indicate that it more frequently exerts a harmful influence than other types of infectious diseases in this locality.

"6. Most of the children in this series that were delivered while malaria was present in the mother were of a race that seems to pos-

sess a relative immunity to the ravages of malaria. This may account for the fact that the negro fetus more nearly approximates the full term of development when associated with this disease, and is comparatively subjected to a less number of the accidents of pregnancy. Many of them revealed evidence of prematurity and were jaundiced, but as a rule they developed rapidly.

"The commonest mishap is miscarriage late in pregnancy. Occasionally stillbirths occur and sometimes there is a fatal issue to both the mother and child.

"7. Cases diagnosed as congenital malaria probably indicate that some accident occurred to the placenta, because it practically never happens that fetal blood is positive at the time of birth, regardless of the degree of infection in the mother.

"Many of the cases now reported in the literature as congenital malaria suggest immediate postnatal infection as their history, as our pathological and clinical records testify.

"8. The size of the intervillous spaces of the placenta and their adaptability in the localization of parasites seem to disprove to a certain extent the old idea that the localization depends on the smallness of the capillary caliber. If this were the case, the brain should be more often the seat of an extensive localization than the spleen, bone marrow, and placenta, yet our anatomical records will not support that theory. A sluggish blood sinus with a large endothelial surface, a higher internal body temperature, and red blood cells burdened with parasites of a certain age beyond the ring form seem to be important factors in the localization and development of the estivo-autumnal parasite."—(R. H. L.)

MOORE, H. F. **A further study of the bactericidal action of ethylhydrocuprein on pneumococci.** Jour. Exper. Med., xxii, No. 5.

In a previous communication the author stated that ethylhydrocuprein, a derivative of hydroquinin, inhibits the growth of and kills pneumococci *in vitro* in very considerable dilution of the drug, and that it exerts a considerable protective action in experimental pneumococcal infections in mice. He has undertaken in this work to obtain some information as to the rate of absorption of the drug into the circulation in the animal body, as to how long the resulting bactericidal effect, if any, of the serum on pneumococci lasts, and as to the mode of action of the drug on these microorganisms. Rabbits were used as the experimental animals. The tolerated and toxic doses of the hydrochlorid of the drug and of the free base were determined, and then experiments were undertaken to determine the action of each one of these preparations when given by different routes.

The author's conclusions from his experiments are as follows:

1. "The serum of rabbits which have been previously treated with a single dose of ethylhydrocupreïn (optochin) exerts a bactericidal action on and later inhibits the growth of pneumococci in the test tube.

2. "These actions are most evident in the serum of rabbits when the base (optochin base) is given in oil subcutaneously; somewhat less when the hydrochlorid of the drug is given in water subcutaneously: slight when the base is given in oil intramuscularly; and least evident or absent when the hydrochlorid in water is introduced directly into the stomach. To get these effects by the intravenous route, toxic doses must be given, and even with toxic nonfatal doses the effects do not last long.

3. "In the case of the base given in oil subcutaneously to rabbits in a dosage of 0.1 gram per kilo of body weight, the bactericidal action of the serum is at its maximum about one hour after administration, and it passes into an inhibitory effect about four hours after the drug has been given.

4. "In man the same inhibitory and bactericidal actions of the serum are present when a single dose of 0.5 gram of the hydrochlorid of the drug is given by the mouth or subcutaneously, but the bactericidal action is not so marked as in rabbits.

5. "When the optochin concentration in the serum has apparently diminished to a certain point in relation to the number of pneumococci present, the pneumococci which have survived the bactericidal action for a few hours acquire the power of growing freely."—(R. H. L.)

CHEMISTRY AND PHARMACY.

E. W. Brown, Passed Assistant Surgeon, and O. G. Ruge, Chief Pharmacist, United States Navy.

Dixon, S. G. A substitute for potassium permanganate to liberate formaldehyd gas from a water solution. Jour. Am. Med. Assn., lxiii, No. 12. Sept. 19, 1914.

This article is now reviewed owing to the increasing cost and scarcity of potassium permanganate, large quantities of which are requisitioned from naval medical supply depots for disinfecting purposes.[1]

The following ingredients are found to give results "in every way comparable to those with potassium permanganate, * * * and the two methods are equally effective from the quantitative standpoint":

Sodium dichromate, 10 ounces avoirdupois.
Saturated solution of formaldehyd gas, 1 pint.
Sulphuric acid, commercial, 1½ fluid ounces.

---

[1] See review under same heading on p. 169.

e acid is added to the formalin, making a stable solution; after ng it is poured over the inexpensive sodium dichromate crystals, n are "spead out in a thin layer over the bottom of a vessel haven times the capacity of the volume of ingredients used." Action ore violent and rapid and involves hasty withdrawal from the artment.—(C. N. FISKE.)

E. J., and SCOTT, T. A. **The preparation of ammonia-free water.** Am. Jour. Pub. Health, v, No. 10, October, 1915.

ese experimenters avoid distillation by precipitating the ammoy mass action; they add 40 c. c. of Nessler's solution (standard ods of Am. Pub. Health Assn.) to tap water and then add an ion of alumina cream until a permanent flocculent precipitate ns on shaking. After settling for one-half hour it is filtered gh a wad of asbestos wedged into a large funnel. The first third e filtrate is returned to funnel for refiltering on account of cloudiness, by which stage the pores of filter become clogged. olor standards it is not necessary to again add Nessler's reagent, ly the definite portions of ammonium chlorid. The standards a slightly different tint from those from distillation, but this not confuse except in presence of large amounts of ammonia, resort would be had to dilution anyway. The asbestos filter es ignition to free it from traces of ammonia. Such ammoniaater remains clear for at least two months [and would, of course, contamination by its contained Nessler's reagent if ammonia d access].—(C. N. FISKE.)

, L., and BROWN, W. H. **Chemopathological studies with compounds of arsenic.** Jour. Exper. Med., xxii, No. 5.

his work experiments were made on dogs and guinea-pigs to ine the character of change in the kidneys and adrenals that lace with the injection of various arsenical preparations. For rk on the kidneys the injections were made intravenously, ritoneally, or subcutaneously, and the effects were found to same whichever route was employed. The various preparased were solutions of arsenious acid, atoxyl, arsacetin, arsenoglycin, salvarsan, neosalvarsan, and galyl.

following conclusions were reached with regard to the kidll arsenical compounds do not produce the same type of renal There are two broad groups of kidneys produced, the red pale, with a variety of subdivisions of each group depending odifications in the chemical constitution of the compound, and length of survival of the animal. The red kidney is

essentially one of vascular injury, the pale kidney is predominantly one of tubular necrosis. In addition various transitional or subgroups exist, in which the kidney, although belonging to the red type, shows relatively a great degree of tubular injury and vice versa.

The conclusions the authors reach from their experiments with regard to the adrenals are as follows:

First, toxic doses of all arsenicals of which we have any knowledge produce definite pathological changes in the adrenals of guinea-pigs. These changes include congestion, hemorrhage, disturbances in the lipoid content, cellular degenerations and necroses, and reduction in the chromaffin content. Second, the character and severity of the injury produced by different arsenicals varies with the chemical constitution of the compounds. The authors believe that adrenal injury is an important factor in arsenical intoxication, and suggest that therapeutic doses of some arsenicals may produce adrenal stimulation.—(R. H. LANING.)

LEE, F. S. **Laboratory experiments with air.** Jour. Am. Med. Assn., lxiii. No. 19, pp. 1625–1628.

In this summary of the contributions of his laboratory to the knowledge of air in relation to ventilation problems the experiments being carried out by the New York State Commission on Ventilation are very briefly described.

In these experiments one group of laboratory animals (cats) was kept for a period of six hours at a temperature of 21° C. (70° F.) and in an atmosphere of 54 per cent humidity. Another group of animals was kept under conditions of humidity as high as 89 per cent at temperatures as high as 33° C. Under these conditions, which were comparable with those of a hot and humid summer day, the body temperature rose on an average of 0.5° during the six-hour period. At the end of this time stimulation of certain muscles of the animals showed that they were able to perform only an amount of work which was 14, 18, and 26 per cent less than was the case with animals of the first group, which had been kept under more favorable atmospheric conditions. A diminution of 13 per cent of the blood sugar was also noted. Further experiments are being carried on along this line.—(E. W. B.)

GOODRICH, G. W. **Comparison of the plating and microscopic methods in the bacteriological examination of milk.** Jour. Infect. Dis., xiv, No. 3, pp. 512–519.

In comparing the relative value of the plate and microscopic methods in the bacteriological examination of milk the author concludes that there is a marked correlation between the two counts; that the

factor 20,000 which is used to reduce the microscopic counts to terms of the plate count is satisfactory; and that the microscopic count from a single slide can be depended upon as being within the limits of one-third as great to three times as great as the plate count, but can not be depended upon as being within 10,000 of the plate count. The microscopic count from a single slide is not sufficiently reliable to warrant the condemnation of market milk, especially when the standard for passing is a low count. Any milk which is "passed" on the microscopic count from a single slide where the passing standard is a low count is not likely to have a dangerously high count by the plate method.—(E. W. B.)

BURROWS, G. T. **Beef frozen for 18 years.** Breeder's Gaz., lxvi, No. 13, p. 484.

Note is here made of a quarter of beef which was kept frozen for 18 years, and at the end of that time showed no indication of putrefaction. The fibers of the meat on microscopical examination appeared normal, and the meat was consumed without any signs of digestive disturbance. It is stated that one reason why this meat maintained its good condition was that it had not been kept in a chamber in and out of which other beef was passing.—(E. W. B.)

DIXON, S. G. **A substitute for potassium permanganate to liberate formaldehyd gas from a water solution.** Jour. Am. Med. Assn., lxiv, No. 5, p. 549.

The formaldehyd solution shipped in combination with sulphuric acid when exposed to extremely low temperature in winter was not found sufficiently stable for northern climates. By adding 1½ fluid oz. of glycerin to the formula a solution was obtained which is moderately stable in low temperature and will withstand polymerization. The following formula is now used: "Sodium dichromate, 10 oz. avoirdupois; saturated solution of formaldehyd gas, 1 pint; sulphuric acid, commercial, 1½ fluid oz.; glycerin, 1½ fluid oz."

It was also found that when the acidulated solution became cloudy on account of low temperature it could be made clear and potent by gently warming it for a long period of time.—(E. W. B.)

FRIEDMAN, A. **Tin poisoning after eating canned asparagus.** Ztschr. f. Hyg. u. Infectionskrankh., lxxv, No. 1, pp. 58–59.

Bacteriological and serological examinations gave negative results, and the poisoning is explained by the tin content of the canned goods, one control sample containing 0.00874 gm. tin per box, and the other 0.03428 gm. In the author's opinion the occasional occurrence of such tin poisoning is ascribable to the fact that some persons are especially sensitive to tin.—(E. W. B.)

Treatment of typhoid carriers with charcoal and thymol or charcoal and iodin.
Merck's Report, October, 1915.

While the internal use of animal charcoal exerts no, or only an unsatisfactory, influence on the bacillary elimination, very satisfactory results have been obtained by the combined administration of charcoal and thymol or of charcoal and iodin. The combination of the remedies mentioned with charcoal seems to be decisive, as neither with thymol nor with iodin, given alone, can the bacillary elimination be permanently accomplished.

Charcoal and thymol.—This combination was first reported on by A. Geronne and W. Lenz (Berl. klin. Wchnschr., 1915, No. 14). These authors gave daily 3 gm. animal charcoal Merck, from blood. and 3 gm. thymol. The charcoal was given in three doses of 1 gm. each one-half hour before each meal, and suspended in about 100 c. c. of water, or included in wafers, while the thymol was given also in 1 gm. doses one-half hour after meals, and inclosed in capsules of 0.5 gm. each. The patients bore these doses for from one to two weeks without any difficulty whatever. Numerous tests, moreover, showed that these doses of thymol and charcoal had no noticeable ill results on the stomach. Extended experiments made in three cases showed that in two of these six weeks, and in the third seven weeks, following the definite suspension of the febrile symptoms, typhoid bacteria were invariably found in the dejections, but after the treatment the dejections were free and remained free from bacilli.

Charcoal and iodin.—This combination was investigated and proposed by F. Kalberlah (Med. Klin., 1915, No. 21). The iodin preparation used by him was the alcoholic tincture of iodin, of which 7–10–15 drops were given three to five times per day in a glass of water one-half hour after meals, while a teaspoonful of animal charcoal Merck, from blood, was also given three to five times daily. Both the iodin and charcoal were borne without any discomfort. The presumable loss of appetite following the ingestion of charcoal, and supposed to be due to absorption of the ferments and digestive pieces, was never observed; on the contrary, a decided increase in weight occurred during the period of treatment. The combination led to very rapid results, and in some cases entire freedom from bacilli was obtained within one week, this condition persisting after the treatment was suspended. Success was had in a case which had resisted other treatment for four months, the dejections having been examined regularly every five to eight days.

Any bacillary elimination via the urine is uninfluenced by the combined charcoal treatment. Where this condition exists, it is advisable to exhibit large doses of formin and salicylic acid or, better, saliformin.—(O. G. R.)

EYE, EAR, NOSE, AND THROAT.

GROW, Surgeon, and G. B. TRIBLE, Passed Assistant Surgeon, United States Navy.

ER, W. B. **The present status of tuberculin therapy in ocular tuberculosis.** New York State Jour. Med., September, 1915.

will be found to disagree with the aphorisms laid down by the r at the outset of a very practical communication upon the t status of treatment by tuberculin in tuberculosis of the eye. are as follows: (1) That, as a means of cure, tuberculin has a d sphere of utility in general and pulmonary tuberculosis; (2) a positive reaction to tuberculin indicates the existence of a ulous focus or of tuberculous toxins; and (3) that tubercle as e of eye disease is more generally accepted than it was 10 or 20 ago.

author has employed bacillary emulsions during a period of years, and has treated by that means a series of 117 cases, in- g affections of the conjunctiva, the cornea, the sclera, the iris, iary body, the retina, the choroid. The author is far from ng that all of the conditions treated and cured by the bacillary on were cases of undoubted ocular tuberculosis. It is more point to note that, with one exception, in not a single case where ive reaction to tuberculin was obtained, did he fail to stop the ss of the ocular lesion. His experiences with tuberculin in f phlyctenulosis of the conjunctiva or cornea, combined with al and general measures usually carried out, have been happy. ences may, nevertheless, take place.—(E. J. G.)

, W. B. I. **On dissolving senile cataract in the early stages.** Tr. Ophth. Soc. U. Kingdom, xxxv, 1915.

conclusions are as follows: "In a consecutive series of 100 s with senile cataract, who were under treatment for not less ree months with alkaline lotions and dionin, fibrolysin, or n drops, 45 per cent of 178 eyes showed a great improvement, ent an improvement, and 7 per cent remained stationary. In nt the treatment failed to arrest the progress of the cataract.

s method of treatment does not cause pain, and patients are ncouraged to persevere with it for prolonged periods. Atten- uld be given to the general health. The internal administra- an alkaline mixture is also of advantage.

eral patients have remained clear of recurrence for a period three to six years."—(E. J. G.)

CHENEY, F. E. **The treatment of glaucoma simplex.** Ophthalmology, April, 1915.

This paper is largely a plea for the systematic employment of myotics rather than of operation in the treatment of glaucoma simplex. He naturally lays great stress on the importance of keeping the sound eye under observation in order to detect the earliest evidences of the disease. Especially in elderly people, where the expected duration of life is not great, so long as the disease, as indicated by the central vision and the field, can be controlled by a myotic, it is best, he says, to stick to this treatment and not resort to operation, even although the tension is somewhat above the so-called "normal." The risks inherent in all operations must be put into the scale when deciding on the line of treatment. He thinks there is reason to believe that myotics have a beneficial action apart from their effect on the pupil.—(E. J. G.)

GRAYSON, C. P. **The exploratory opening of the sphenoidal sinus.** Laryngoscope, xxv, No. 2.

The author advocates making the artificial opening in the anterior wall of the sinus at a point as close as possible to the angle of junction of its floor with its internal wall. After being assured by repeated radiographs if necessary that there are no anomalies, the operation is performed as follows: The inner or nasal portion of the anterior surface of the sphenoid body is exposed as widely as possible by shrinking the turbinates with adrenalin. The field is anesthetized by cocain and then rendered ischemic by the adrenal solution. The course of the spheno-palatine artery is usually distinctly visible. The field is rendered sufficiently sterile by a dilute tincture of iodin solution. With a straight drill, tipped by a conical burr 6 mm. in length and measuring $2\frac{1}{2}$ mm. from its point to its greatest diameter an opening is made 2 or 3 mm. above the line which divides the anterior from the inferior surface of the sphenoid body and close to the attachment of the ethmoid plate in the middle line. The opening made is 2 mm. in diameter, a size sufficient to permit the escape of any fluid within the sinus or to permit irrigation or enlargement if necessary by biting forceps.—(G. B. T.)

RICHARDSON, C. W. **Tonsillectomy in the adult. Are we justified in doing so many indiscriminate tonsillectomies for remote infections?** Laryngoscope, xxv, No. 5.

The belief that the tonsils are the source or the portals of entrance of systemic infection has become so fixed that the fact there are many other sources of infection playing as important a rôle as the tonsils is in danger of being overlooked.

The operation has become so popularized that even the layman considers himself competent to judge of the advisability for doing the operation, and presents himself with the statement that he has come to have his tonsils removed. The removal of tonsils that are hypertrophied, the seat of chronic lacunar infections, of superficial or deep-seated abscess, those suffering from frequent acute attacks of simple or follicular tonsillitis, or in which there are recurrent attacks of peritonsillar abscess is a most justifiable procedure.

On the other hand, the frequent removal of tonsils which show no macroscopic evidence of disease and in which there has been at no period frequent acute pathological disturbances, because the possessor may be the subject of an infection that can not be accounted for is not justified because it was possibly through them the infection was brought about.—(G. B. T.)

BOOT, G. W. **The diagnosis of otosclerosis.** Illinois Med. Jour., xxviii, No. 3.

The author defines otosclerosis to be a nonsuppurative osteitis of the bony capsule of the labyrinth, secondary to a primary focus of infection elsewhere in the body, the same process that occurs in rheumatoid arthritis.

The following conditions may be present:

1. Otosclerosis causing fixation of the stapes.
2. Otosclerosis in the vicinity of the stapes without causing fixation.
3. Otosclerosis involving the apical turn of the cochlea.
4. Otosclerosis involving any intermediate portion of the cochlea.
5. Various combinations of the above, the most frequent of which is the otosclerosis in the vicinity of the stapes, with fixation of the stapes.
6. Any of the above conditions may be advanced, with degeneration of the organ of Corti or of the cochlear branch of the auditory nerve.

Bezold's triad, since it is dependent upon fixation of the stapes, is present in the first and fifth of these conditions.

The symptoms are: (*a*) Elevation of the lower tone limit; (*b*) bone conduction prolonged for A (Edelman set), normal vibration 3 minutes—a prolongation of 30 seconds speaks for ankylosis of the stapes.

(*c*) Negative Rinné for A. This may vary from a shortened positive Rinné through a plus or a minus Rinné to a negative Rinné. In addition there is (*d*) Paracusis Willisii. (*e*) Explosive subjective noises and there may be dizziness.

Involvement of the various portions of the cochlea, etc., show symptoms dependent upon the area involved and the presence or absence of fixation of the stapes.

The series of 50 cases showed the drum membrane normal in 27 cases, one or both drum membranes retracted in 23 cases. A reddish tint was present in the region of the promontory in four cases. The upper tone limit was lowered in 44 cases, normal in 5, not noted in 1.

The lower limit was 128 or over in 33 cases; explosive tinnitus was noted as present in 30 cases; absent in 8. No record in the remainder. Paracusis Willisii was noted in 30 cases.

The females numbered 36 in this series, with an average age of 28 years and 8 months at the onset of the disease. Bone conduction was prolonged in 33 cases; shortened in 2.

The males numbered 14, with an average age of 19 years 8 months at the onset of the disease.—(G. B. T.)

MUNDT, G. H. **Syphilis of the internal ear.** Illinois Med. Jour., xxviii, No. 3.

Acquired labyrinthine syphilis usually occurs in the tertiary or the secondary stages. The lesion is usually bilateral, and according to Swift and Ellis, it should not be considered an isolated disease of the organ of hearing, but merely a manifestation of syphilis of the central nervous system.

All or any of the symptoms which may be produced by disease of the internal ear may be present, deafness, tinnitus, dizziness, and disturbed equilibrium.

The deafness is of sudden onset, rapidly becoming marked, but usually is not later progressive, while the subjective noises are very persistent and may be annoying after the deafness is complete.

Differentiation from otosclerosis is usually possible by the rapidity of onset in syphilis of the internal ear, and from the history of the case, the prognosis according to the author is good, given an early diagnosis with energetic treatment.

The treatment recommended is frequent intravenous injections of salvarsan, followed by inunctions of mercury, to be repeated if the Wassermann remains or becomes positive.—(G. B. T.)

BATROFF, W. C. **Collapse of the alae nasi, its etiology and treatment.** Laryngoscope, xxv, No. 2.

The pathological collapse of the alae nasi occurs during forcible inspiration; normally these structures slightly dilate with deep breathing. Patients may overcome this difficulty by lifting the alae with their fingers.

The causes of this condition are atrophy of the lower levator muscle group, relaxation of the subcutaneous tissues, and a sharp

vertical curvature of the alar cartilage. Secondarily, collapse of the alae nasi may occur in those suffering from chronic nasal obstruction.

TREATMENT.—The use of various forms of splints and dilators, varying from rings of soft rubber tubing, metal forms, or the hard rubber splints devised by Schmidhuisen is usual. The last named are made in rights and left, conform to the shape of the nose, and are invisible externally.

OPERATIVE PROCEDURES.—The method of Walsh is the elevation of a strip of mucous membrane from the septum, which is rolled up into the angle and secured there. The method of Lack is to turn up a small strip of cartilage (septal) and secure so as to produce adhesions. This method is seriously impaired in usefulness because a septal perforation is left.—(G. B. T.)

REPORTS.

A BRIEF SUMMARY OF THE PROFESSIONAL ACTIVITIES OF THE HOSPITAL SHIP "SOLACE" WHILE IN THE PRESENCE OF THE MAJOR PORTION OF THE ATLANTIC FLEET AT GUANTANAMO BAY, CUBA, FOR 40 DAYS, FROM FEBRUARY 21, 1915, TO APRIL 2, 1915.[1]

By R. M. KENNEDY, Medical Inspector, United States Navy.

The *Solace* did not arrive at Guantanamo Bay, Cuba, until February 21, 1915, having been delayed in departing from the New York Navy Yard until February 16, 1915, on account of undergoing necessary repairs, and remained at Guantanamo Bay until April 2, 1915, in the presence of the major portion of the Atlantic Fleet, on which date practically all vessels departed from that locality.

During the vessel's brief stay of 40 days in Cuban waters its service was extremely active and much important work was accomplished, as will be seen from the following data submitted:

Total number of patients admitted	241
Total number of patients discharged to duty	147
Total number of patients died	1
Total number of contagious cases admitted:	
Measles	10
Mumps	31
Tuberculosis	8
	49
Total number of venereal cases admitted and their nature:	
Gonococcus infections	10
Chancroids	3
Syphilis	32
	45
Greatest number of patients on board at one time	130
Greatest number of contagious cases on board at one time	18
Average number of patients daily on board	83
Number of laboratory examinations made, nature, and result:	
Urine—	
Albumin	85
Sugar	2
Negative	112

[1] From official report to the Bureau of Medicine and Surgery.

Number of laboratory examinations made, nature, and result—Continued.

Sputum—	
Positive for tuberculosis	4
Negative for tuberculosis	7
Blood—	
White counts	38
Differential	31
Negative for malaria	8
Wassermann tests	285
Throat cultures—	
Negative for diphtheria	1
Positive for Vincent's angina	1
Throat smears—	
Negative for Vincent's angina	2
Negative for treponemata	4
Positive for Gram positive diplococci	2
Feces—	
Positive for blood	1
Negative for parasitic worms	3
Smears from penis—	
Positive for Gram negative diplococci	5
Negative for Gram negative diplococci	3
Scraping from sore on penis, negative for treponemata	6
Scraping from ulcer in mouth—	
Positive for treponemata	1
Negative for treponemata	2
Smear from ulcer on tongue, positive for treponemata	1
Smear from eye, negative for streptococci	1
Scraping from skin ulcer, negative for parasites	3
Smear from ear discharge, positive for Gram negative diplococci	1
Pericardial exudate and scraping from aortic valves, positive for Gram negative diplococci	1
Smear from tonsil—	
Positive for bacilli and spirillæ	1
Negative for bacilli and spirillæ	1
Smear from ulcer on leg, negative for treponemata	2
Urine sediment, negative for acid-fast bacilli	1
Blood culture, negative	1
Blood coagulation, 3½ minutes by capillary tube	1
Total	567

Greatest number of laboratory examinations made in one day 65

Number of eye, ear, nose, and throat examinations, treatments, and nature of operations performed:

Eye treatments	299
Refractions	47
Ear treatments	160
Nose treatments	143
Throat treatments	64
	713

Number of eye, ear, nose, and throat examinations, treatments, and nature of operations performed—Continued.

Polypi	7
Submucous resections	8
Turbinotomy	1
Mastoid modified, radical	1
Frontal sinus	2
Septal spurs	2
Cauterization	2
Total	781

Number of major and minor operations performed, their nature, and the number of intravenous administrations of salvarsan:

Major operations—	
Amputation, arm	1
Adenectomy, cervical	1
Appendectomy	9
Excision mammary gland	1
Excision of rectal fistula	1
Excision of rectal fissure	2
Hepatotomy (liver abscess)	1
Herniotomy	6
Kilian, modified (frontal sinus)	2
Mastoid, modified, radical operation	1
Suturing fractured patella	1
Suturing perforated stomach and intestines	1
	27
Minor operations—	
Circumcision	2
Hydrocele, radical operation	1
Hemorrhoidectomy	3
Varicocele, radical operation	3
Tonsillotomy	1
	10
Total major and minor operations	37
Intravenous injections of salvarsan	53

Nature of work done in the dental department, itemized:

Fillings—	
Amalgam	126
Cement	57
Abscesses lanced	11
Calculus removed	21
Gums lanced	1
Pulps capped	1
Pulps devitalized	14
Pulps extirpated	55
Root canals filled	28
Teeth extracted	40
Teeth treated	160
X-rays	2
Pyorrhea treatments	7
Total	523

Number of X-ray examinations made and parts examined:

Head—	
Nasal septum	6
Occiput	1
Frontal sinus	5
Maxilla inferior	3
Maxilla superior	1
Shoulder	2
Chest	7
Kidney	6
Elbow	4
Radius and ulna	4
Foot	15
Femur	2
Hand	13
Tibia and fibula	2
Patella	9
Total	80

DUTY IN CONNECTION WITH THE DETENTION CAMP AT DEER POINT, GUANTANAMO BAY, CUBA.[1]

Measles having appeared among a draft of men on the U. S. S. *Texas*, it was decided to establish a detention camp at Deer Point, and in obedience to orders I reported on February 25, 1915, to the officer in charge to assist and advise him as to the sanitary measures to be employed in this connection. I took with me from the *Solace* one hospital apprentice, first class, and the necessary surgical and medical equipment.

Three hundred and thirty-eight men, in charge of a lieutenant and three ensigns, were landed on the morning of February 25. Tents, cots, mess gear, and mosquito nets were supplied by the ships of the fleet. A large bungalow was available for quarters for officers; a room in one corner was utilized as a dispensary.

Deer Point is a high-lying promontory and forms naturally an ideal location for a detention camp, as the land approach is narrow and can be easily patrolled. A dock situated on the southern side of the promontory is the only other point of access.

The sanitary aspects may be conveniently considered as follows:

FOOD SUPPLY.—Supplies were sent daily by the commissary of the U. S. S. *New York*. Mosquito netting tacked over a suitable frame made a fly-proof structure for the preparation and preservation of food; immediately in front of this four army-model camp ranges were set up. For purposes of administration, the men had been divided into three companies. Each company was provided with a mess tent, and meals were served out near these tents. The men were required to eat in the tent or in its vicinity. Special attention was

[1] Report submitted by M. E. Higgins, passed assistant surgeon, United States Navy.

n to policing these tents. The food was well cooked, varied in racter, and, on the whole, exceptionally good.

ATER.—There is a permanent water installation on the camp site, supply being the same as that furnished the naval station. Its without boiling or chemical treatment is general and it is apntly a safe water. Adequate quantities were available for bathnd scrubbing. All clothing was scrubbed on one of the docks.

SPOSAL OF EXCRETA.—This feature did not present any difficulty, there are three closets and a large concrete urinal leading tly into the water of the bay.

ARBAGE.—An old incinerator on the end of the point was repaired. mple number of covered casks were secured and garbage was ted and burned.

SECTS.—Very few flies appeared, due, unquestionably, to the ugh protection and disposal of garbage. Mosquitoes were not rous, but nets were furnished and the men were required to hem at night. Sand flies were present in considerable numbers roublesome.

et of regulations bearing on personal hygiene was drawn up and d on the bulletin board.

imming was encouraged and proved to be a valuable diversion. bags were thoroughly inspected and the contents were exposed direct rays of the sun for an entire day. All bags, hammocks, oiled clothes were scrubbed.

Texas sailed from Norfolk on February 20. Five cases of es developed en route and were transferred to the *Solace* on ary 24. After transfer to the camp one case of measles apd on the 26th, and four more on the 27th. On March 3 one of mumps developed. These cases were transferred to the as soon as diagnosed. The mess gear was sterilized by boiling e cots were exposed to the sun for two days.

nt, separated from the main camp, was put up and used for ious cases; two such appeared. They proved to be simple itis.

cases of measles from the camp were obviously contracted beoing to the *Texas*. In view of the great amount of sunshine season and the free circulation of air throughout the camp ay and night, it was highly improbable that secondary cases occur.

March 4, 1915, I was relieved by Surgeon J. A. Murphy, States Navy, and returned to the *Solace*.

SERIOUS CASES OF GUN-SHOT WOUNDS PRODUCED BY THE SAME BULLET.

ng target practice on the rifle range at Guantanamo Bay, March 26, 1915, one cartridge was accidentally fired from a

machine gun. The bullet injured three men who were standi directly in front and within a few feet from the muzzle of the g as follows:[1]

Case 1. H—, private. The bullet, a .30 caliber, cupro-nic jacket, entered the pelvic cavity through the left great sacro-scia notch, nicked the sciatic nerve, perforated the bladder, and emer on the right side above the crest of the pubis external to the sp matic cord. Both wounds of entrance and exit were small, cl cut, and the bony pelvis and intestine were not involved. There incomplete paralysis of the left anterior tibial nerve. Patient catheterized and about 300 c. c. of blood and urine withdrawn. large soft-rubber catheter was introduced and retained in the blad for continuous drainage. The urine drained clear and free f blood after the third day. Both wounds healed promptly and valescence progressed uneventfully. Partial paralysis of the terior muscles of the leg persisted when the patient was transfe to a shore hospital April 7, 1915.

Case 2. R—, chief gunner. The bullet from *Case 1* struck lower end of the left humerus and exploded, shattering the and completely disorganizing the elbow joint. The arm was putated in the middle third.

Case 3. F—, gunner's mate, third class. The left arm was dled with small lead fragments from the exploded core of the bu several of the larger pieces perforated the arm and lodged in chest wall, one large irregular wound, in the left sixth interc space external to the nipple line, opening the pleural cavity. patient vomited blood, and signs of severe abdominal hemorr rapidly developed. An exploratory laparotomy was perfo through a large left through-rectus incision. The left side o peritoneal cavity was found to be filled with blood and feces, e ing from four large ragged rents in the transverse colon nea splenic flexure. The edges of these openings were trimmed sutured by a double reinforced layer of Pagenstecher linen. peritoneal cavity was then mopped dry. A large opening was lo in the left arch of the diaphragm and sutured with chromic ca There was evidence that the pericardium was lacerated near the w through the diaphragm. The lesser peritoneal cavity was now op and clotted blood removed, exposing a ragged wound of the post wall of the stomach and projecting into its cavity the deformed j of the bullet, thus accounting for the large ragged wounds prod and the deflected course of the wound tract. The opening in stomach was trimmed and sutured with double layers of linen deep implication to guard against reopening from sloughing de ized tissue. Convinced that all perforations were closed and he

[1] Report submitted by H. F. Strine, surgeon, United States Navy.

ge controlled, large rubber tubes were introduced—one to the
nd in the diaphragm, one to the lesser peritoneal cavity, and one
he pelvic pouch. The abdominal wall was then closed. Saline
tion was administered intravenously and later by proctoclysis.
onsidering the loss of blood, the character and extent of the in-
, and the fact that the left half of the peritoneal cavity, left
ral cavity, and probably the pericardium were soiled with colon
ents, the patient did well for five days. A left-sided localized
yema developed and about 300 c. c. of bloody infected fluid was
drawn. Physical signs over the left lower lobe suggested a de-
ping pulmonary abscess. Abdominal discharge profuse. Bowels
y moved by enemas. Temperature and pulse remaining about
Respirations 30. Persistent annoying cough.

April 3 the ship en route to Washington encountered a strong
and the patient vomited repeatedly during the night. April 4
ge fecal fistula opened, and from this time on his condition grad-
became worse. April 5 and 6 he complained of severe pain in
ardiac region. An alarming attack of dyspnea occurred, the
was displaced to the right, and a tympanitic percussion note
d over the sternum and to the left. An aspirating needle was
luced and a quantity of gas and colon pus evacuated with im-
te relief from cardiac distress.

prognosis was now considered hopeless, and in this condition
s transferred on April 7 to the United States Naval Hospital,
ington, D. C., where he died six days later.

SANITARY REPORT ON BARCELONA, SPAIN.[1]

By H. L. Brown, Passed Assistant Surgeon, United States Navy.

celona, Spain, with a population of nearly 800,000, is situated
shores of the Mediterranean, on a broad, sloping plain, which
sed by two rivers, the Llobnegat, and the Besos. It has a
rn aspect, and is partially surrounded by a range of pic-
ne mountains, the highest of which, Mount Tibidabo, rises 1,729
bove sea level. It is a city, although insanitary, unique for
uty and situation.

IATE.—Barcelona is noted for its mild and equable tempera-
he mean being from 61° to 63° F., or about 50° in winter
° in summer. It is remarkable for the small number of rainy
scarcely 25 or 30 through the whole year), its clear skies, and
of strong winds, fogs, frosts, or snow.

[1] From official report to the Bureau of Medicine and Surgery.

WATER SUPPLY.—The water supply of the city of Barcelona is obtained by means of pipes from the two above-mentioned rivers. These rivers run within a few miles of the city, and as there are many small settlements located on their banks the water is easily contaminated, and there have been enormous epidemics of typhoid fever and cholera traced to this source. There are no reservoirs or filtration plants for the city, the water being piped direct from these rivers and distributed to the city main. It is a well-known fact that it is dangerous to use city water without boiling, and while many of the better classes use boiled water, the poorer classes seem to think it of no importance or too much trouble.

MILK SUPPLY.—Both cow's and goat's milk are supplied to inhabitants, and it is considered dangerous to use milk from these sources, as so many of the cattle are tubercular, and herds of goats (from 10 to 20 in each herd) are driven through the streets and milk peddled from house to house as needed, the goats being stopped in front of a house and milk furnished. The goats are insanitary and dirty in appearance. The milk of these goats is recognized as the source of Malta or Mediterranean fever. During a recent epidemic of this disease in Barcelona most of the cases occurred in families using goat's milk for drinking purposes. Most of these goats were originally imported from Malta, and in this connection it may be interesting to note that in 1905 the S. S. *Joshua Nicholson* shipped 65 goats in Malta and an epidemic of Malta fever broke out on board, nearly all those who drank the milk of these goats being attacked.

SEWERAGE.—While there has been an attempt to install a sewerage system for the city, the present system is inadequate and inefficient. A system of pipes extending from an elevation near the outskirts of the city attempts to drain the better resident and business sections. They run in an inclined direction through a certain section only, and at intervals run on a level without a sufficient incline to permit drainage. Under this arrangement of the pipes foul gases accumulate, and the escaping odors are so bad that often the pipe lines are opened at intervals and chlorinated lime poured into them. This system of pipes leads through the city and drains into the inner and outer harbors, giving off offensive odors and contaminating these waters, making bathing and washing of decks extremely dangerous. Upon raising ship's anchors in the inner and outer harbors, a large quantity of dirty, foul-smelling mud is raised. The city is insanitary, and especially so in the tenement and poorer districts, where there are few, if any, sewers. Some quarters have cesspools in their yards, and these contain, in most instances, stagnant water, giving off offensive odors, and serve as breeding places for mosquitoes and other insects. The tenement districts, with their narrow, dirty, filthy, congested, thickly inhabited streets, swarming with flies, mosquitoes, and other

cts, present to the eye a picture most repulsive to civilization against all laws of sanitation. Flies, mosquitoes, fleas, and other cts are almost a pest, and, owing to the exposure of cafés and t stands to the open streets, diseases are no doubt propagated by e means. Almost every ship observed in the harbor had rat rds installed on its lines leading to the dock. Rats are a pest ig the docks and wharves, and no attempt has been made to de-y them. An epidemic of bubonic plague occurred here in 1907, sed many deaths, and lasted for several months; during this time ny rats were destroyed.

)ISEASES.—During October, November, and December, 1914, there urred a large epidemic of typhoid and typhus fever in the city, t of the cases being traced to contaminated water supply. There e about 40,000 cases of fever, and 1,400 deaths occurred within eriod of two weeks. Young adults were particularly affected, the death rate among the young men and women was very high. public report was made of this epidemic, as the authorities used y effort to suppress such a report. Cholera occurs in epidemic n and causes a high death rate. Frequent epidemics of confluent llpox occur, and the city is rarely free from this disease. Many he inhabitants object to vaccination. Vaccine virus is obtained n Germany and Switzerland and is not of a very good quality. erculosis is very prevalent and the annual death rate from this ase is very high. There is no house quarantine against conta-s and infectious diseases. There is scarcely any segregation of stitutes, and venereal diseases are very prevalent.

OSPITALS.—The following are the local hospitals: Hospital Clinico, pital de Sagrada, Hospital de Santa Cruz, Hospital de San Pablo, Enfermeria Evangelica. The first is government owned, the nd is provincial, the third and fourth municipal, and the fifth is ate. The Hospital de San Pablo is tastefully designed, recently pleted, will accommodate about 200 patients, and is modern and o date in every respect. They are in neat order and apparently managed, and nearly all will accept outside patients.

bill of health is required of all ships, and port quarantine regu-ns are enforced. A ship entering the port of Barcelona flies uarantine flag and pratique is granted by the health officer of the if no quarantinable diseases are on board. The port quarantine lations require that if a ship enters port with cholera, plague, ellow fever on board, she shall fly the yellow flag over a square lag. In such a case the quarantine officer will board the ship. e port regulations require that the ship must have been at sea 10 since the last case of cholera, 12 days for yellow fever, and 14 for plague before pratique is given, or the ship will be detained

at sea until the above quarantine period for each disease has expired. There is a quarantine station at Port Mahon, on the island of Minorca, about 138 miles from Barcelona.

SANITARY NOTES FROM THE U. S. S. "SARATOGA."[1]

By H. R. HERMESCH, Passed Assistant Surgeon, United States Navy.

During the month of June a trip was made up the Yangtze River as far as Woochang and various ports visited en route. While in the river the heat and humidity had a markedly depressing influence on the crew, but the cruise was too brief to result in any permanent damage and only a few cases of malaria (tertian) and dysentery (endamebic) developed. At the end of this cruise the ship anchored off Woosung Forts to coal. Here the weather was quite cool, particularly during the night, and within 24 hours fully one-third of the ship's company reported at the sick bay with mild attacks of gastroenteritis. This epidemic was not traceable to any defective foodstuff, but is believed to have been caused by the sudden lowering of temperature, with drafts, after the severely hot weather up the river. Most cases responded promptly to a dose of castor oil, but a few were sufficiently severe to require stimulation.

The month of July and part of August was spent in Chefoo, China. During most of the time spent in this port a camp was maintained on Kentucky Island, and the benefit to be derived from camp life was shown by a marked improvement in the general physical condition of the crew.

While in this port, five cases of severe gastroenteritis developed in members of the wardroom mess. The symptoms were choleraic in character and the condition was undoubtedly of bacterial origin, as all cases ran a fairly definite temperature chart. By the time preparations were made to study the condition by more exact laboratory methods the material was exhausted, as no further cases developed. At this time there were no cases of cholera in the port, but most careful supervision was exercised as to the kind and quality of foodstuffs purchased for the crews' and officers' messes. Nearly five months during the year were spent in Shanghai, and considering the number of infectious diseases that are endemic and periodically epidemic in this port, it is remarkable, with the extensive liberties granted, how infrequently cases occurred in the crew. At different times, epidemics of diphtheria, typhoid, smallpox, and plague occurred, without a single case of any such disease developing in the crew. This, however, is not true of the venereal diseases, for which Shanghai is renowned, and approximately 75 per cent of our yearly number of cases were contracted in this port.

[1] From Annual Sanitary Report, Jan. 1, 1915.

The four months in the Philippines were spent at Olongapo, Manila, and on the target range in Manila Bay. Here the incidence of all the infectious diseases, including venereal disease, was strikingly low.

Of the contagious diseases there were 13 cases of measles and one of typhus fever. Measles developed first in a straggler, who had spent about a week in Shanghai, and in only one case could infection be traced directly to contagion aboard ship, the other cases developing mostly sporadically among the crew from a focus of infection ashore.

The cases were all promptly transferred to the Shanghai Municipal Isolation Hospital, with the exception of the first case. The first case had to be isolated on board ship, as permission for transfer was not granted for the reason that the patient was a prisoner. The typhus fever case was a fairly typical mild typhus and occurred in a hospital apprentice who had visited Peking about two weeks before the onset, and in which city the disease was prevalent at that time. The ship spent 10 days at Chinwangtao during the latter part of October, and while there about 150 men availed themselves of the excursion trips to Peking. With the exception of the venereal diseases, the above case of typhus is the only infection traceable to these excursions. The case developed after the ship had returned to Shanghai and was transferred to the Shanghai Municipal Isolation Hospital. The sick bay was thoroughly fumigated with sulphur dioxid, and no more cases developed.

SANITARY NOTES FROM THE U. S. S. "HELENA."[1]

By W. L. MANN, Jr., Passed Assistant Surgeon, United States Navy.

The health and morale of the personnel, except as otherwise noted in this report, have been good. The crew is, as a rule, happy and contented. This duty[2] is not unpleasant, and many of the enlisted men are serving, at their own request, for a protracted period on this ship.

The medical officer has noted an absence of the "near sick." This is a vague and indefinite but comprehensive group of chronic neurasthenical cases that tend to develop or show exacerbation when the naval service becomes monotonous or onerous. This is more notable in tropical climates or when a ship has been absent for a long period from a satisfactory liberty port.

Aboard this ship, as well as the other river gunboats observed, there is a spirit of unity of action, psychologically known as mass action, which is so essential to military success. This spirit may be attributed

[1] From Annual Sanitary Report, Jan. 1, 1915.
[2] Yangtze River.

to the frequent liberties, temperate climate, variegated and diversified experiences, and fascinating duty.

Infectious diseases.—It is noticed that pulmonary tuberculosis suspects have been prevalent aboard this ship in the past few years. I would like to suggest the possibility of schistosomiasis. This disease causes similar pulmonary and clinical symptoms, so that the diagnosis between these conditions is only made possible by the discovery of the causative agents. This is very difficult in the majority of cases.

Two cases of endamebic dysentery were treated aboard and were amenable to treatment.

Upon joining this ship at Ichang, China, there were 16 men on the "list," presenting numerous and various symptoms. Further investigation resulted in the fact that the majority of these cases were schistosomiasis. A special report will later be forwarded on this subject. As a symptomatic treatment intravenous injections of salvarsan has proven a specific; its use, however, does not effect a permanent cure. One adult schistosomum was discovered in the stool. As far as I have ascertained this is the first discovery that has ever been reported.

The total number vaccinated was 196, with positive results of 20.91+ per cent.

During the past six months the medical officer has been baffled in the diagnosis of many obscure and puzzling cases. Many of the cases subsequently proved to be schistosomiasis, and others are considered specific diseases endemic to this region which have not been classified in medical literature. Even some of the common diseases have proven atypical. The following interesting cases may be briefly mentioned:

Choleroid case.—Patient returned from liberty at 8 p. m. and shortly afterward was attacked by violent cramps, purging, and vomiting, presenting all the initial symptoms of cholera. The muscles of the extremities and recti were firmly contracted by clonic myospasms. Duration of symptoms, 12 hours. Two days later his companion on this liberty was attacked by the same symptoms.

Diphtheroid cases.—Case began as ordinary follicular tonsillitis. The follicles later on spread to uvula and soft palate. These tended to remain discrete, but in some places coalesced into a membrane. Only with difficulty were the follicles removed, a raw, bleeding surface remaining. The case was isolated as a diphtheria suspect, although repeated examinations were negative for Klebs-Löffler bacilli. About one week later a similar case developed, with edema of uvula and with follicles spread irregularly over posterior nasal pharynx and both surfaces of soft palate. Both cases ran an acute course.

Typhuslike cases (pappataci or sand-fly fever?).—The initial symptoms were chill, vomiting, pains in back of neck and over lumbar region. Temperature 102° to 104° F. On fourth day a maculopapular rash developed over body and extremities, which lasted five

s. Leukocytes 9,000 to 13,500. The fever dropped to normal on fifteenth day. (This man slept over sand locker.)

our days later another case developed. The eruption in this case papular and discrete. Duration of fever two weeks. Leuko-s 7,000 to 8,000. These cases will be reported more fully.

rgical cases.—One large perinephretic and one large gluteal ss were operated upon under general anesthetic. One fatal case testinal ulceration with secondary involvement of the appendix, h at autopsy was discovered to have multiple hepatic abscesses, operated upon. Endameba is suspected as the etiology. Micro-ical sections by the Harvard Medical School of Shanghai, China, d to show any definite ameba. None was discoverable, ante em or post-mortem.

other case which was examined by six medical officers was as many different diagnoses, varying from hysteria to liver ss. This case recovered after three weeks' duration without cal interference. There is evidence to suggest that this was a of liver abscess with spontaneous cure by rupture into the in-es.

neumonia case developed septic symptoms. Careful examina-y four medical officers failed to show any physical signs sug-g pus or fluid in the pleura, yet an intercostal incision evacu-bout 1,000 c. c. of pus.

ccord with expressed opinions of several medical officers I must that the results of the venereal prophylaxis are not very grati- However, an endeavor is made to realize maximum benefit he same. Compulsory use of the prophylactic when returning liberty is required. Contrary to expectations, the type of al disease has not been malignant.

le at Hankow, China, it was noticed that several cases devel-hancroids on dorsum of penis near pubes, evidently infected by ne woman with a lesion on the vestibule. Upon investigation discovered that nine men attributed their disease to the same A letter to the civil authorities resulted in the removal of this of infection. It is interesting to note that six of these cases ed into suppurative buboes.

VOL. 10 NO. 2

UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

ISSUED BY

THE BUREAU OF MEDICINE AND SURGERY

NAVY DEPARTMENT

DIVISION OF PUBLICATIONS

PASSED ASSISTANT SURGEON ROBERT C. RANSDELL, U. S. NAVY

IN CHARGE

APRIL, 1916

(QUARTERLY)

WASHINGTON

GOVERNMENT PRINTING OFFICE

1916

NAVY DEPARTMENT,
Washington, March 20, 190

This United States Naval Medical Bulletin is published by di
tion of the department for the timely information of the Med
and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretar

NOTE.

Owing to the exhaustion of certain numbers of the Bulletin and the fre
demands from libraries, etc., for copies to complete their files, the return
of the following issues will be greatly appreciated:

Volume I, No. 1, April, 1907.
Volume I, No. 2, July, 1907.
Volume II, No. 1, January, 1908.
Volume II, No. 2, April, 1908.
Volume VII, No. 3, July, 1913.

SUBSCRIPTION PRICE OF THE BULLETIN.

Subscriptions should be sent to Superintendent of Documents, Gover
Printing Office, Washington, D. C.

Yearly subscription, beginning January 1, $1; for foreign subscription
cents for postage.

Single numbers, domestic, 25 cents; foreign, 31 cents, which includes f
postage.

Exchange of publications will be extended to medical and scientific org
tions, societies, laboratories, and journals. Communications on this s
should be addressed to the Surgeon General, United States Navy,
ington, D. C.

TABLE OF CONTENTS.

PREFACE.

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part as extracts) throughout the service, not only will they be employed to some purpose as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Reviews of advances in medical sciences of special professional interest to the service, as published in foreign and home journals, will be given particular attention. While certain medical officers will regularly contribute to this work, it is urged that all others cooperate by submitting such abstracts from the literature as they may at any time deem appropriate.

Information received from all sources will be used, and the bureau extends an invitation to medical officers to prepare and forward, with a view to publication, contributions on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

W. C. Braisted,
Surgeon General, United States Navy.

S. NAVAL MEDICAL BULLETIN.

10. APRIL, 1916. No. 2

SPECIAL ARTICLES.

ENERAL CONSIDERATION OF THE PRESENT STATUS OF VESICAL PAPILLOMA.

C. LEHR, Assistant Surgeon, Medical Reserve Corps, United States Navy; Professor of Genito-Urinary Surgery, Georgetown University.

e reason for presenting this subject of vesical papilloma is the interest that is attached to its present status by genito-urinary ons and the uncertainty existing in many minds as to the early osis of malignancy and the treatment to be followed in a given

us take up briefly the consideration of bladder tumors. Generpeaking, tumors of the bladder are rather rare as compared to s elsewhere in the body, and form but one-quarter to one-half nt of all tumors. Küster places it as high as 7.6 per cent. Still our improved methods of diagnosis they are far more common formerly supposed, and in these the occurrence in males over es is three to one. These statistics are rather uncertain, as the urologist sees only men, there is no way of getting at the e percentage. The same applies to the gynecologist as well.

time of onset varies greatly, one of the youngest cases reported 16 years, and the oldest I have so far met with in the literature 75.

cal tumors have been divided according to their structural sition as representing three principal tissues, epithelium, con- tissue and muscular tissue, the first being derived from the onic entoderm, and the last two from the mesenchyma of the erm. The tumors arising from epithelial tissue are, papilloma, na, carcinoma, and simple cysts, and of these I only wish to r papilloma and carcinoma, the tendency of the former to o malignant degeneration, and the difficulty of diagnosis.

LOGY.—The etiology of tumors, as you all know, still remains ed, and it would take far too long to even mention the many s advanced. I suppose the most generally accepted are the eim and the parasitic theories, with the greater evidence still port of Cohnheim's embryonic cell inclusion doctrine; or shall that the more tangible idea of parasitic cause lends itself asily to disproof than the theory of Cohnheim? At any rate, he Croft Cancer Commission published its report it was a able blow to the parasitic theory.

The traumatic or irritation hypothesis, which includes as one of its forms the parasitic theory, is particularly interesting in bladder tumors, as in so many cases a cystitis is coexistent. Leichtenstern calls attention in this connection to the relative frequency of vesical tumors among the aniline-dye workers of Germany, whose urinary tracts are subjected to repeated chemical irritation.

Calculus seems to play a very slight part, although in one of my own cases a calculus impacted in the lower end of the ureter was the site of a rather extensive papillomatous growth, although the calculus was very probably secondary in nature.

Thus we approach the subject in the dark, and can only describe the pathology and give the histological picture.

PATHOLOGY.—I am sorry that the length of my paper does not allow me to go more into details in this connection, because some of the most important work is being done along this line, in connection with the recognition of early malignancy in these cases. Histologically these tumors are composed of a framework of connective tissue, with a network of fine blood vessels, completely covered with epithelial layers, usually pedunculated, though they may develop over quite an area of the bladder, or several may arise from a single pedicle. The network of blood vessels accounts for the frequent hematuria associated with these cases, due to a breakdown of the epithelial layers from ulceration or trauma.

As to their location, they may occur anywhere in the bladder, or may arise from the mucous membrane covering the prostate gland and urethra. In by far the majority of cases they are found in the lower half of the bladder, and especially about the ureteral orifices. Fenwick pointed out that 43 per cent of papillomas were situated close to the ureteral orifices.

Papillomas may appear either as pedunculated growths or as sessile tumors and vary considerably in size. The pedunculated form is the most common and is distinguished by its pedicle. Its presence is, however, often overlooked, since its extensive arborescence may completely shroud the view of the cystoscopist.

They may occur singly or multiple and involve the mucosa of the bladder to a greater or less extent. In its more extensive state it has been described as papillomatosis, where the growth extends over most or even the entire bladder wall. This condition is usually malignant.

All authors seem to agree as to the tendency of papilloma to recur not necessarily at the site of the previous operation, but apparently by implantation in some other locality of the bladder mucosa, and in many of these cases the recurrence is malignant. Motz gives the percentage as one in four. It has been further shown that benign papilloma may coexist with carcinoma, either in different parts of the bladder or a papilloma may be found superimposed on a car-

ma. This latter condition, however, has been disputed in a recent r by Buerger, which we shall have occasion to refer to later. lly, one of the most important possibilities is the malignant neration of the benign papilloma; and herein lies the crux of natter—that is, the ability to recognize the early degenerative ss.

do not have to agree with Albarran, who in 1897 in his article *Annales de Maladies des Organs Genito-urinaires*, states that esical tumors are malignant or likely to become so," but at least ust recognize that all bladder tumors are potentially malignant. ghty finds between 75 and 80 per cent of all bladder tumors nant.

il very recently the opinion was held that a pathological diag-was not reliable, and the question of malignancy was decided in cases by the appearance of the tumor and, to a certain extent, age of the patient. It has always been maintained that it was ible to obtain adequate material for histological study by any opic or nonoperative means, since any carcinomatous changes apilloma take place in the so-called depth or in the base of the where they are inaccessible to our methods of examination. iscouraging state of affairs was somewhat relieved by a paper ned last August by Leo Buerger, entitled "The Pathological sis of Tumors of the Bladder, with Particular Reference to oma and Carcinoma." From a study of the pathology of 113 of the bladder, among which there were 55 papillomas, 45 ry carcinomas, 5 squamous carcinomas, 2 metastatic carci- and 6 sarcomas, he was able to conclude that a differential sis between papilloma and carcinoma can be made in almost ances on a pathologic basis, depending on—

. That morphological characteristics varying from the benign *occur* when a tumor either possesses or has acquired the clini-ts of malignancy;

d. That material can be reached by cystoscopic instruments h certain morphological criteria indicative of malignancy can onstrated; and

. That the examiner possess the power to recognize these when they do occur.

morphologic criteria consist in cells manifesting irregularity nd shape; nuclei rich in chromatin, deeply staining, and of a shape; cells with atypical mitosis, giant cells, and multi- cells. All these when occurring in a papilloma of the bladder the presence or begining of a carcinomatous change. He at certain variations in the type of cell belong to the benign as well, and that the proper estimation of such changes to a great extent upon personal interpretation. These do not occur in the depths, but manifest themselves first in

the epithelium not far from the surface, either with or without areas of inflammation. In only 1 tumor out of the 113 was a papilloma found to infiltrate and still retain normal cellular characteristics.

On reading this paper several difficulties have occurred to my mind.

First. He lays stress on individual interpretation of the morphological criteria, and again emphasizes that the examiner possess the power to recognize these criteria when they do exist. Therefore it requires a pathologist carefully trained and with great experience along these lines, who may not always be available.

Second. Since papilloma and carcinoma may coexist in the bladder, either as separate tumors or possibly in a papilloma that is undergoing malignant degeneration, all parts of the tumor may not show the morphological criteria; therefore how will we know from what point to obtain our material, since it is recognized that one can not in many cases differentiate from the appearance?

Third. It is not advisable from a surgical point of view to interfere with a malignant growth without first blocking the blood and lymph supply. I do not think, however, this would hold as much in malignant bladder tumors as in malignant tumors elsewhere, since these usually protrude from the vesical wall, and any bleeding occurs into the bladder. Besides tumors situated in this locality are anyway subjected to much irritation during the act of micturition.

Finally, in the diagnosis of malignancy Geraghty lays special stress on the lack of connective tissue and increased epithelial cell proliferation.

Symptomatology and diagnosis.—Often there are absolutely no symptoms in the early stages of the disease, although an early diagnosis is most important, not only to prevent malignant degeneration, but also as concerns the method of treatment.

Hematuria is the most important symptom and is in the majority of cases the first symptom recognized. Albarran found it in 75 per cent of his cases, and in the 12 cases that have come under my own observation it was present in every one. The hematuria is often spontaneous in character and has no reference to exercise or trauma, being caused by the breaking off or necrosis of villi. The bleeding is often very profuse, owing to the vascular character of the growth, and occurs at intervals with increasing frequency as the disease progresses.

If the blood is abundant it is bright in color, and from being mixed with the urine gives the appearance of being in larger quantity than is really the case.

Pain is almost always associated with the existence of a carcinomatous tumor in its advanced stages, and radiates to the sciatic and anterior crural regions. Tumors seated near the neck of the bladder may also cause pain and partial obstruction, and lastly pain on micturition will be present if cystitis supervenes.

Evidence furnished by the urine may be important, although frequently overlooked in routine examination. It consists in the presence of bits of the tumor representing portions of the villi which may show a characteristic structure, or may be simply necrotic masses denuded of epithelium.

Watson and Cunningham lay some stress on the frequent and long-continued presence in the urine of polymorphous cells, the larger part of which are fusiform in shape and have large nuclei, and while they do not differ essentially from the normal epithelium in the deeper layers of the bladder mucous membrane, they occur in no other condition, and in such large numbers and so persistently, as in connection with tumors.

From this we see that there is no so-called cardinal symptom, and what is worse, all those we have described might be termed late symptoms, and in all probability only reveal a tumor after it has progressed to a considerable degree; add to this, that when the patient finally reaches the urologist he has only too often undergone a long period of treatment which has allowed the further progress of the disease. Albarran gives the following figures as to the length of time that elapsed in 141 cases of vesical tumors from the appearance of the first symptom to that of the first observation by the surgeon: In 35 cases, from three months to one year; in 96 cases, from one year to eight years; and in the balance of the cases periods as long as thirty years having elapsed.

Of course the diagnosis lies entirely in the use of the cystoscope.

TREATMENT.—After pointing out some of the difficulties and uncertainties in diagnosis, we now approach the still more debatable point of treatment. Here opinion varies from the advocacy of the most conservative to the most radical procedures. The most conservative treatment is based on the fact that by far the majority of these tumors are malignant and generally recur after extensive operative measures. The most radical advocate that once their malignant nature is established nothing short of cystectomy affords prospect of any permanent relief.

Now let us consider what methods of treatment are at our disposal and with what success they have been employed. In this connection we can simply express an opinion from the results obtained by others and from our own experience.

Generally speaking, the methods for attacking vesical growths are as follows:

First. Operative.

(*a*) By means of the operative cystoscope.
(*b*) Simple excision of the tumor.
(*c*) Excision with a portion of the bladder wall.
(*d*) Partial or complete cystectomy.

Second. Fulguration.

Third. Radium.

And we might add a fourth method by combining fulguration with radium.

In the operative method removal by means of the operative cystoscope or simple excision of the tumor is no longer practiced, except occasionally as an initial procedure in fulguration. The remaining methods are all being used, each one having enthusiastic supporters, so that the treatment in a given case may vary considerably even in the hands of the best genito-urinary surgeons.

Fulgeration, while by many limited to benign papilloma, still has strong advocates for its use in certain malignant conditions. By way of illustration, let us take Young and Geraghty, who claim that fulguration should be the treatment selected for all papillomas, benign or malignant, in which infiltration of the bladder wall has not occurred, and that it yields results incomparably superior to the most radical operative procedures. They emphasize the fact that when the papillomas are malignant the response to fulguration may be extremely slow and lead almost to discouragement. Sometimes small malignant papillomas will require many times the amount of treatment which would have been necessary to destroy a benign papilloma of the same size. Geraghty cites one case of a malignant multiple carcinoma covering the left lateral wall of the bladder in which 75 treatments, extending over a period of 9 months, were necessary entirely to eradicate the neoplasm. A very remarkable result was obtained in three cases by him where bone metastases occurred a year or more following the treatment, but where the bladder still remained free of growths. He excepts as unsuited for this form of treatment the lobular carcinoma and malignant growths generally where the bladder wall has been involved. These should be subjected to operation.

I have at present two cases of malignant papilloma under treatment by fulguration, both in men over 60 years old, and both too extensive for any other method short of total cystectomy. In the one case 14 treatments have been given and a marked diminution in the growth is evident; the other is too recent to show any appreciable change.

On the other hand, Squier, Buerger, and Walker hold that once malignancy is proven nothing short of radical operation should be considered, and that the management of a case of vesical carcinoma is no different from that of carcinoma anywhere else in the body, which is, if the growth is accessible, wide surgical extirpation. Squier modifies this statement somewhat by saying that "further experience may develop more ingenious means to use radium intraves-

." and advocates its use before operation to lessen the danger nor transplants.

ink we all realize that while operative treatment of cancer ere in the body offers the best result up to the present time, is far from satisfactory in all cases, and every surgeon has had ences where at the time of operation he had every reason to he had extirpated the entire growth. Is this not possibly due t to our lack of knowledge of the pathology of cancer? Do t often see in identical cases of carcinoma, or at least where athological diagnosis is identical, a great difference in their al malignancy and in the rapidity of their growth? Two cases ame under my observation tend to illustrate this point. Both ases of papilloma on the lower surface of the bladder. In both the pathological report showed carcinoma, and both seemed cal in character. In neither case did the bladder wall seem ated, and no difference could be made out in the cystoscopic e. Both were operated on and the tumor with the surround-adder wall excised. In the one case convalescence was unevent-d the bladder remained free from recurrence for more than a ince which time I have lost sight of the patient. In the other eath occurred within eight months from a diffuse carcinoma bladder wall and the suprapubic wound. In the case of recur-I had attempted to destroy the tumor before removal. In the case I had not. These cases are more than three years old, and hen improvements have been devised in the operative technic , in all fairness, I must say might have influenced my results. growths are now more thoroughly destroyed, either by means guration or the Paquelin cautery before removal, and the opera-eld is kept clean by means of suction, and not by sponges, to t transplant. But even with the improved technic similar re-re doubtless met with. In cases of long standing, and most of ases are when they come to operation, their complete extirpa-no easy matter, when we take into consideration their location e difficulty of exploring the surrounding structures for exten-the disease. Metastases occur usually in the pelvis, bone, and in the order of their frequency, and are therefore often im-e to deal with surgically.

l cystectomy is seldom resorted to any longer, except for the of pain, since in the case of any malignant growth that has ssed so far as to necessitate the removal of the entire organ, ases have almost invariably taken place which would not be d even by this most radical operation. However, should an n for this operation arise a double nephrostomy would give results, to my mind, than any attempt to transplant the ureters e rectum, where the intolerance of the rectal mucosa for urine

often renders the suffering of the patient extreme, and infection invariably follows.

The subject of fulguration has been dealt with extensively in the literature, and I have already referred to the excellent results claimed for it, even in malignant cases, by certain authors. It seems certain that its action is more than cauterization, though what it is we do not know, and its usefulness and limitations still offer a field for investigation. I have not mentioned the de Keating-Hart method of fulguration, as no statistics are available, and while it apparently gives satisfactory results when used in carcinoma in other parts of the body, I do not know whether it would be applicable to bladder tumors.

Radium is still in its experimental stage, and just like so many new therapeutic agents, extravagant claims have been made as to its efficacy, which later results have not borne out. Radium is being extensively used in the Brady Institute in Baltimore, and while Dr. Young emphasizes the fact that it is experimental, still some very excellent results are claimed for it, especially in connection with fulguration.

Briefly it is used as follows: A capsule containing 100 mg. of radium is inserted into the end of a specially constructed cystoscope, of which Dr. Young has devised several very ingenious ones, their use depending on the location of the tumor in the bladder. The capsule containing the radium is screened except for a window opposite the growth to be treated. This prevents the *alpha* and *beta* rays, which have a tendency to burn, from reaching the normal portions of the bladder, and concentrates these with the *gamma* rays, having the therapeutic value on the tumor. The growth is exposed to the radium for one hour once a week, and is generally fulgurated two or three days following each application of the radium.

Three cases that were cited seemed especially interesting, where fulguration had been used in a lobular carcinoma without effect, but when used in connection with radium had caused a disappearance of the growth.

Again with radium we do not know how it acts, but, unlike fulguration, it does not burn the tumor, but seems to cause it to become absorbed or to melt away. Radium also has the effect of lessening pain, even in those cases which have gone too far to be benefited by any form of treatment. In this review I have attempted not to quote statistics more than was necessary to emphasize the points, and not to refer to my own cases except where they would be of value as an illustration.

Conclusions.—I have tried to show the importance of early diagnosis in these cases, the difficulty of diagnosing beginning malignancy, and the difference of opinion as to treatment held by genito-

ry surgeons. Therefore, from the opinions of others and from wn experience, I have come to the following conclusions:

The early recognition of malignancy in vesical tumors is still ain, except in the hands of a pathologist specially skilled and arge experience in these cases.

On account of the location and inaccessibility of these growths, where they occur in the vault of the bladder, surgical meas- f the most radical character are often unsatisfactory.

artial or total cystectomy should not be resorted to without xploring the abdominal cavity for metastases, especially the

ll papillomas where malignancy is suspected, except lobular ma or where infiltration of the bladder wall has occurred, are essarily subjects for surgical interference.

hile fulguration and radium are still in the experimental urprisingly good results have been obtained by their use in ma in the hands of reliable men; and a more persistent use in a given case might be followed by a more favorable opin- heir therapeutic value.

ED USE OF COMBINED TABLE OF OCCUPATIONAL DISTRIBUTION OF PHYSICAL DISABILITY.

By C. N. Fiske, Surgeon, United States Navy.

annual report of 1910, covering the naval medical statistics calendar year 1909, the Surgeon General of the Navy began h a table showing the occupational distribution of the causes cts of disability which at that time seemed of most impor- preventive medicine; special disease and disease groups as combinations of ratings were arbitrarily selected with the pose of assisting the sanitarian in locating the predominance and results of disability. Fortunately the bureau has been ontinue the tabulation of these data for six years, although es a considerable amount of clerical labor. It should be wever, that several changes in the table were made by addi- mission from year to year which subtracted immaterially accumulative value to hygiene until 1914 (for calendar year hen effort seems to have been made to make the table com- ll causes of disability by arbitrary groups which precluded deration of such special diseases as malaria, rheumatism, tis, alcoholism, tuberculosis, typhoid fever, neurasthenia, ntery, besides seven certain formerly determined groups. separate tabulation was begun for hernia, parasites, and for reasons which have not been announced. Sick days tabulated for the calendar year 1910.

Table to show average annual distribution of certain causes of

Character of disability.	Officers.		Artificers.				Miscellaneous force.	
	Navy and marine.	Mid-shipmen.	Electricians.	Engine room.	Fire-room.	All others.	Clerical.	Culinary.
6 years, 1909-1914:								
Average complement	3,526	801	1,823	3,202	10,852	1,482	1,267	3,432
Venereal diseases	47	11	215	408	2,498	216	161	685
Rate per 1,000	13.33	13.73	117.94	127.42	230.19	145.75	127.07	199.53
Genito-urinary disease (nonvenereal)	44	21	30	44	186	23	22	40
Rate per 1,000	12.57	26.84	16.36	13.74	17.09	15.29	17.63	11.51
Eye diseases	38	124	22	29	91	16	15	22
Rate per 1,000	10.73	154.60	11.89	9.06	8.40	10.91	11.71	6.46
Ear diseases	32	12	10	18	106	9	9	11
Rate per 1,000	8.65	14.77	5.76	5.67	9.74	6.30	7.23	3.35
Mental diseases	10	1−	4	11	53	6	4	12
Rate per 1,000	2.70	.62	2.10	3.33	4.90	4.16	3.55	3.45
Suicides	1+	0	1−	1−	1+	1−	1−	1+
Rate per 1,000	.38	0	.27	.20	.15	.45	.39	.56
4 years, 1909-1912:								
Average complement	3,479	764	1,710	2,997	10,408	1,345	1,161	3,319
Contagious diseases	266	300	124	185	1,093	102	94	204
Rate per 1,000	76.60	392.02	72.37	61.89	104.99	75.65	81.40	61.54
Digestive diseases	181	264	35	79	286	41	27	70
Rate per 1,000	52.10	345.16	20.50	26.36	27.43	30.30	23.69	21.24
Skin diseases	75	136	33	98	489	42	22	78
Rate per 1,000	21.63	177.36	19.01	32.62	46.98	31.04	19.16	22.14
Respiratory diseases (except pneumonia and tuberculosis)	104	55	29	41	214	22	19	43
Rate per 1,000	29.97	71.68	16.81	13.60	20.51	16.17	16.15	12.96
Injuries	196	156	107	248	1,051	108	45	181
Rate per 1,000	56.34	204.52	62.87	82.25	100.93	80.30	38.54	54.56
Malaria	30	4	8	26	70	12	8	19
Rate per 1,000	8.62	5.56	4.82	8.51	6.73	8.92	7.11	5.84
Rheumatic affections	55	14	15	50	217	20	13	40
Rate per 1,000	15.88	18.00	8.77	16.60	20.85	15.06	10.77	12.13
Appendicitis and peritonitis	36	13	9	22	90	13	9	19
Rate per 1,000	10.20	17.02	5.26	7.26	8.61	9.48	7.75	5.85
Alcoholism	10	1	3	31	68	14	13	7
Rate per 1,000	2.94	1.65	1.90	10.43	6.49	10.78	10.98	2.18
Heart affections	14	4	4	10	47	5	3	9
Rate per 1,000	3.95	5.89	2.19	3.17	4.47	3.53	3.01	2.64
Tuberculosis	15	2	10	20	51	7	6	23
Rate per 1,000	4.24	2.63	5.99	6.76	4.90	4.83	4.74	7.01
Typhoid fever	15	13	3	8	27	2	3	5
Rate per 1,000	4.31	17.01	2.05	2.59	2.62	1.49	2.37	1.50
Heat affections	5	1	1	9	62	2	1	2
Rate per 1,000	1.44	.67	.88	3.00	5.99	1.49	1.06	1.49
Neurasthenia	31	2	4	8	20	3	6	3
Rate per 1,000	8.84	2.63	2.34	2.67	1.97	2.22	4.95	1.05
Dysenteric affections	15	2	3	8	14	2	2	5
Rate per 1,000	4.38	2.63	1.46	2.67	1.37	1.12	1.94	1.43
2 years, 1913-1914:								
Average complement	3,621	873	2,048	3,611	11,741	1,758	1,479	3,662
Hernia	16	2	9	20	69	11	8	17
Rate per 1,000	4.42	2.29	4.39	5.54	5.83	6.26	5.41	4.78
Parasites	10	6	15	18	87	12	16	40
Rate per 1,000	2.76	7.45	7.32	4.85	7.41	6.55	10.48	10.92
Tumors	4	4	1	3	23	3	1	3
Rate per 1,000	1.10	4.58	.49	.97	1.92	1.71	.67	.96
6 years:								
Deaths	15	1	6	15	51	8	5	17
Rate per 1,000	4.35	1.66	3.20	4.84	4.73	5.17	3.81	4.86
Invalided from service	[1]23	[1]5	26	43	242	22	18	68
Rate per 1,000	6.64	6.49	14.63	13.69	22.30	15.07	14.60	20.00
Total sick days [2]	34,106	7,830	15,863	33,533	124,924	16,295	10,219	35,252
Damage [2]	112.40	24.44	59.44	120.83	488.60	59.62	39.48	139.04
Total loss and noneffective (rate per 1,000)	31.88	35.01	32.61	37.74	45.02	40.23	31.16	40.50

[1] 1912—57 cases—0.92; 1913—22 cases—0.33; 1914—13 cases—0.19.

[2] Total damage in terms of individuals whose loss of service by sickness, disaharge, or death would be represented as continuous throughout the year.

disability among occupational groups in U. S. Navy, 1909–1914.

Miscellaneous force—Continued.				Seaman branch.			Total for all occupations.				
Hospital.	Marines (enlisted).	Musicians.	Prisoners.	Apprentice seamen.	Ordnance.	All others.	Number personnel.	Deaths.	Invalided from service.	Sick days.	Damage.
1,185	9,571	983	976	2,551	1,863	18,736	62,251	....	....	....	....
99	2,080	88	26	314	192	3,752	10,792	3	178	145,499	[2] 488.94
84.47	217.32	89.52	26.64	123.09	103.06	200.26	173.36	.048	2.86	....	7.85
21	171	9	8	96	22	267	1,004	11	67	21,928	99.05
17.86	17.83	8.99	8.37	3.70	11.89	14.29	16.13	.182	1.07	....	1.59
13	107	9	3	43	14	137	683	0	92	13,903	84.07
10.55	11.20	9.49	3.42	16.99	7.25	7.32	10.97	0	1.47	....	1.35
10	99	7	4	79	8	148	562	.5	104	13,110	88.15
8.58	10.36	6.95	4.10	30.97	4.47	7.89	9.13	.080	1.68	....	1.42
5	38	3	6	19	3	43	218	2	100	9,539	77.12
4.22	4.01	2.88	6.32	7.58	1.79	2.28	3.47	.035	1.61	....	1.24
0	4	0	0	1—	1—	4+	17—	17	0	17	8.55
0	.42	0	0	.19	.27	.24	.27	.268	0	....	.13
1,117	9,378	902	892	2,593	1,669	18,376	60,110	....	....	....	....
110	909	67	36	1,228	102	2,082	6,902	26	3	68,723	202.65
98.70	96.90	74.72	40.92	473.58	61.11	113.27	113.16	.437	.05	....	3.37
34	337	20	15	48	35	420	1,892	6	17	22,188	72.25
30.44	34.82	21.90	17.94	18.42	20.97	22.86	31.47	.100	.28	....	1.20
18	361	21	21	128	47	841	2,408	4	16	29,667	91.21
16.56	37.44	23.00	24.10	49.85	28.01	45.78	40.06	.062	.27	....	1.52
23	191	18	4	267	18	323	1,371	11	68	21,055	96.87
21.04	20.30	20.23	5.04	103.07	10.94	17.55	22.80	.179	1.14	....	1.61
51	731	36	38	223	134	1,715	5,021	102	204	85,442	386.93
46.11	77.90	40.47	42.32	85.90	80.14	93.33	83.52	1.701	3.39	....	6.44
11	434	6	2	17	11	142	800	1	1	8,419	24.05
9.62	46.24	6.65	2.24	6.46	6.74	7.71	13.31	.013	.02	....	.40
13	165	12	8	58	17	249	946	.25	59	23,957	95.22
11.41	17.62	13.03	9.53	22.18	10.19	13.57	15.73	.004	.99	....	1.58
30	68	5	6	19	10	137	486	9	7	16,287	52.59
26.63	7.22	5.82	7.01	7.42	6.29	7.47	8.09	.158	.18	....	.87
4	91	3	1	1	5	47	299	4	6	1,714	9.69
3.58	9.70	3.60	.56	.19	2.85	2.53	4.97	.075	.09	....	.16
5	64	3	1	41	5	49	264	15	81	8,150	70.31
4.70	6.82	3.88	1.40	15.72	2.85	2.68	4.39	.245	1.34	....	1.17
13	51	5	5	18	5	85	316	21	153	11,501	118.49
11.41	5.46	5.82	5.33	7.04	3.15	4.64	5.26	.345	2.55	....	1.97
7	23	2	1	20	3	49	181	10	0	9,765	31.73
6.04	2.45	2.49	.56	7.71	2.10	2.67	[1] 3.02	.171	0	....	.53
1—	8	0	1—	1	1	19	114	.5	1	481	2.07
.22	.85	0	.28	.58	.60	1.03	1.89	.083	.02	....	.03
4	19	3	1—	2	3	18	127	0	28	5,006	27.71
3.58	2.05	3.05	.56	.58	1.95	.98	2.11	0	.46	....	.46
4	55	1	1—	2	4	26	144	1	3	3,440	11.42
2.38	2.05	1.66	.28	.87	2.55	1.43	2.39	.013	.06	....	.19
1,319	9,956	1,144	1,146	2,468	2,248	19,459	66,533	....	....	....	....
8	58	5	3	32	11	100	369	0	28	16,377	58.87
6.44	5.78	4.37	3.05	13.17	4.89	5.11	5.55	0	.42	....	.88
6	176	20	3	80	10	212	711	5	3	12,868	37.01
[illegible]	17.68	17.49	3.05	32.41	4.67	10.87	10.69	.008	.05	....	.36
2	19	1—	1	4	5	25	69	4	6	2,597	12.11
.30	[illegible]	.44	1.31	1.62	2.25	1.26	1.19	.069	.08	....	.18
1	42	4	1	19	11	21	270	....	....	....	
[illegible]	4.24	[illegible]	1.05	7.58	5.99	3.77	4.33	....	....	....	[2] 2,049.12
[illegible]	[illegible]	14	6	277	12	301	1,488	....	....	....	[3] 42.52
[illegible]	[illegible]	[illegible]	6.15	108.85	6.62	16.08	23.90	....	....	....	
[illegible]	[illegible]	6,102	4,496	49,209	13,090	173,278	[6] 846,895	....	....	....	
[illegible]	[illegible]	23.71	13.81	282.77	49.85	865.99	[2] 2,008.61				
[illegible]	[illegible]	[illegible]	[illegible]	110.84	26.75	35.56	40.58				

[2] Average 5 years only. [3] Average 3 years only. [6] Average for 6 years.

These occupational tables are really endowed with great value; perhaps potentially with more than all the other worthy statistics which the bureau publishes. The ready understanding of its figures is simple indeed, but familiarity with its truths by medical officers generally is not evidenced by frequent current use. Reasons may be advanced that statistics lack interest and may be made to prove almost any preconceived contention if handled with only ordinary cleverness; while the figures themselves may be considered fairly trustworthy the deductions may be fallacious. However this may be, it seemed well worth while, for self-amusement if for no other purpose, to devote one's spare half hours through several months to combining and computing the tables for six years, and then possibly making a few specimen analyses or random "deductions" to show what use the combined table might serve even at the risk of detracting from its real value by faulty reasoning or interpretation.

The examples used in this brief are but a few of perhaps several hundred which in competent and experienced minds might simplify the solution of not only our most vexing problems but also, by asserting unsuspected high rates, suggest numerous conditions hitherto unappreciated. In the first place the combined table deals with 3,878,373 sick days, 226,639 admissions, 8,928 invalidings, 1,619 deaths, covering the six most recent years of medical experience in the Navy; it deals with 373,508 persons for one year or 62,251 men for six years; the figures are thus seen to be sufficiently large to preclude in most cases accidental and misrepresentative conditions. A few of the glaring fallacies inconsistent with naval experience may be explained by recollection of the peculiar circumstances involved.

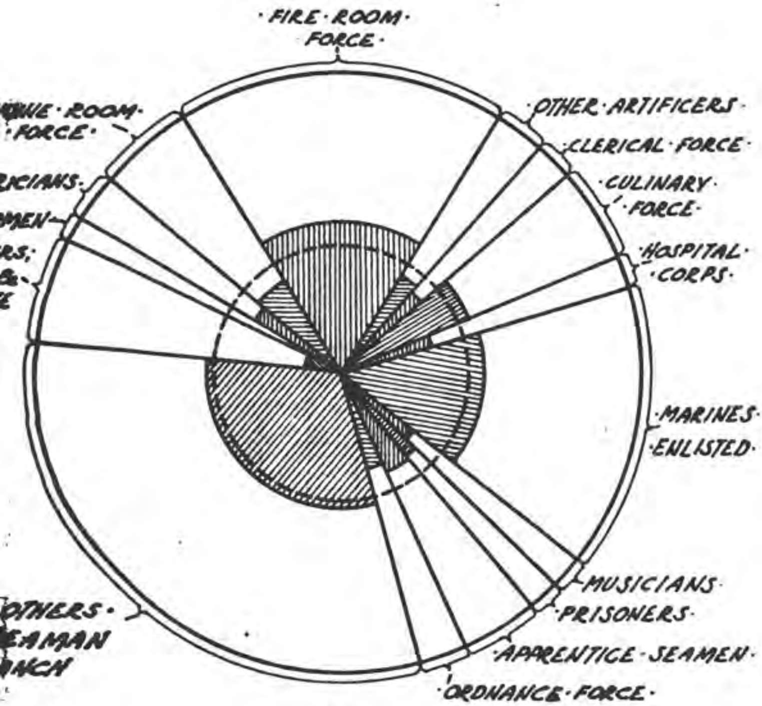
For reasons indicated in the second paragraph disability groups have been separated into three classes covering six, four, and two years, respectively, and average complements have been computed for these periods upon which to compute rates. Decimals have been in most columns disregarded for average admissions, deaths, and invalidings, but were used in determining correct rates. Two decimal places have been considered, except in the death-rate column. A few footnotes have been made to guide those who might not recall the circumstances or read the text.

VENEREAL DISEASES.—The subject of venereal diseases has recently been brought again to service attention by an experienced observer[1] who, from the use of certain statistics, takes anything but an optimistic view of the ultimate value of medical prophylaxis.

Now, let it be noted what has been the movement of venereal morbidity during these six years of experimental medical prophylaxis, disregarding, for the moment, any question of correlation of prophylaxis itself with the results.

[1] Holcomb, R. C. Has our Propaganda for Venereal Prophylaxis Failed? Military Surgeon, xxxviii, No. 1, January, 1916.

e *average* admission rate for the entire service has been 173.36 housand and invaliding rate 2.86 per thousand. The worst *ge* offenders have been the fireroom force, 230.19; marines, 2: miscellaneous deck force, 200.26; and culinary (!), 199.53. honor men, aside from, apparently, officers and midshipmen, been prisoners (who lacked opportunity for exposure), hos-



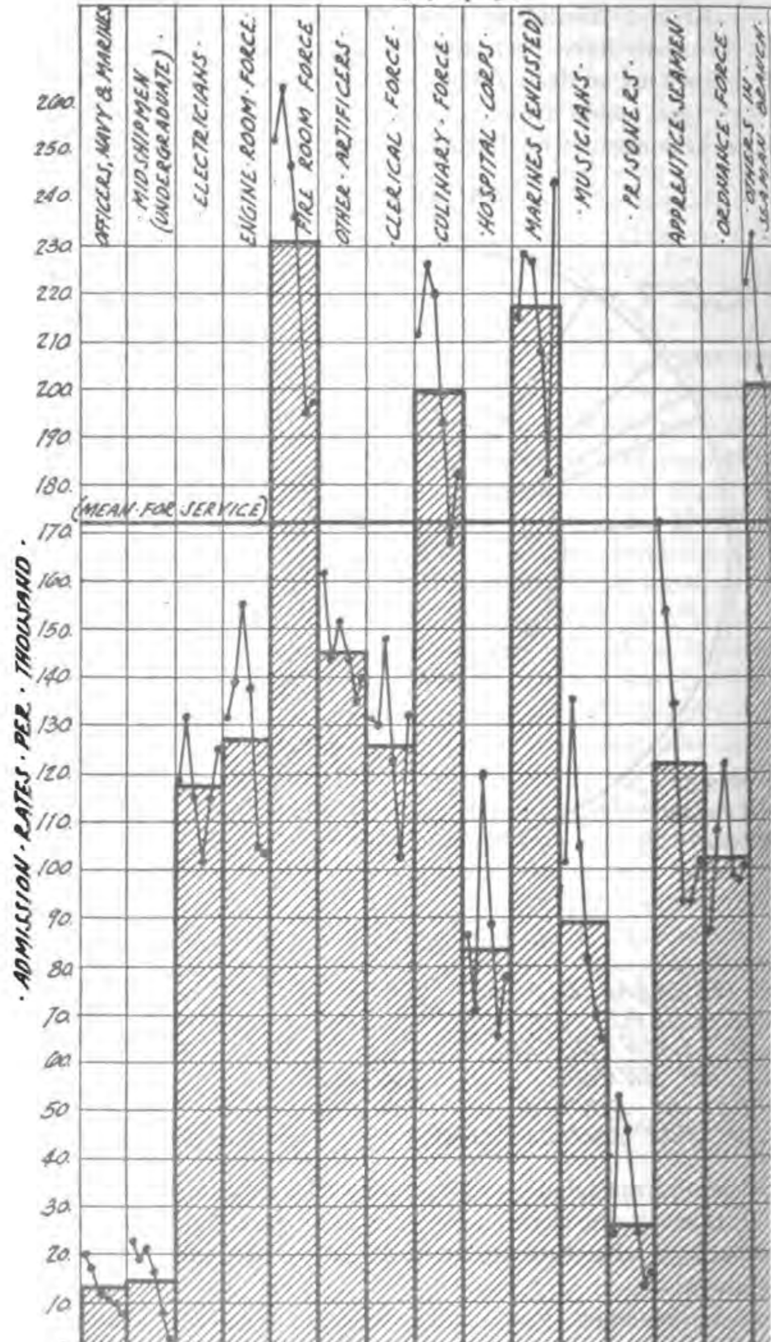
·FIG·I·

VENEREAL BLOT ON PERSONNEL OF NAVY AND
IE CORPS, SHOWING BY AREA AVERAGE PROPOR-
OF EACH OCCUPATIONAL GROUP CONTRACTING
TION ANNUALLY FOR 6 YEARS.
EA OF DOTTED CIRCLE INDICATES MEAN PRO-
N FOR ENTIRE SERVICE. R.M. BARKER, HA1c.

rpsmen, musicians, ordnance workers (gunner's mates and aptains), and electricians. Apparently refinement in labor llect or education conduces to or corresponds with refine- morals.

I illustrates graphically venereal incidence among the f naval personnel more truthfully than does fig. II, the clean of which it is not practicable to extend to the 1,000 mark. ne care to average venereal admissions for the entire serv-

·FIG·II·



DISTRIBUTION AMONG OCCUPATIONAL GROUPS OF AVERAGE IN
OF VENEREAL DISEASES FOR 6 YEARS 1909–1914 U.S. NAVY
MARINE CORPS. CURVE OF ANNUAL VARIATION OF INCIDE
RATE PLOTTED OVER RESPECTIVE COLUMNS. — R.M. BARKE

ice in the circle of fig. I, he might imagine the sector represented by the fireroom force to be entirely black and the remaining area clear; the "blot" would not then look quite so serious to civilian social workers and moralists who seem to derive satisfaction from comparing known military statistics with the unknown morbidity of civil life.

Similarly instructive figures can be easily drawn to scale both for distribution of disease and injury and also, by plotting column rates, to illustrate the hazards of any occupational groups.

But this is by no means the whole story; if over the columns drawn to represent average admission rates (fig. II) there are plotted the respective rates for each of the six years (from each year's table) it will be noted that there have been marked variations. The admission rate for the entire service continuously dropped from 199.17 in 1909 to 143.09 in 1913, and in 1914 rose to 162.82. Why did the venereal rate improve so remarkably and progressively for the four years, 1909 to 1914, when the greatest efforts were being exerted for medical prophylaxis, and then abruptly rise somewhat (although not so high as before 1913) during the year 1914 of comparative relaxation of *medical* prophylaxis? Perhaps it is coincidence and not correlation due to exterior causes which fail to occur to or convince one who really believes that most venereal disease can be prevented by timely prophylaxis, and one-half of the former incidence can be in practice and repeatedly has been obviated by *strenuous* cooperation on the part of medical officers and hospital corpsmen.

The specialist in preventive medicine is more concerned with admission rates, which signify the incidence of the diseases he seeks to prevent, than he is in sequelæ; yet, if the admission data are suspected of unreliability, he may well leave that fundamental of hygiene and consider the medical results as manifested, for example, in the invaliding rate.

It is a fact that the service invaliding rate for venereal diseases has fallen from 4.28 per thousand in 1909 to 3.29 in 1910, 3.06 in 1911, 2.52 in 1912, 2.03 in 1913, and, lastly, to 1.71 in 1914. Objection to crediting this remarkable drop in invaliding rate to medical prophylaxis has been made, because of alleged more effective modern treatment of syphilis, although the admission rate for syphilis has dropped from 27.18 in 1911 to 19.84 in 1914.

Opinion seems to differ among experienced officers in naval hospitals regarding ultimate results from modern treatment of syphilis, still the contention that the invaliding rate is favorably influenced thereby is to a considerable extent justified; but what has, at the same time, cut in two the invaliding rate for gonococcus infection from 1.83 in 1909 to 0.95 in 1914? It would seem that through some

means half the invalidings from gonorrhea had likewise been prevented.

It may be that extravagant claims or hopes expressed by early writers on venereal prophylaxis led some to expect some such panacea as that for typhoid; if that is the case it is not surprising that the "half loaf" attained has not satisfied such expectations. Very few nowadays belittle antitoxic sera for diphtheria, meningitis, or tetanus even though they fall far short of the efficacy of cowpox vaccine.

Moral prophylaxis certainly is necessary and will be for as many generations as will be required to reform human nature in civil life, which is the source of the naval and military personnel, and in the meantime preventive medicine will continue to accomplish whatever it may succeed in inducing practitioners to undertake by discerning encouragement.

Now, to return to Figure II, the individual admission rates, year by year, plotted over the average columns show that a majority of the occupational groups have contributed notably to the diminution of venereal disease; to this result the engine, fireroom, and culinary forces and musicians, apprentice seamen, and miscellaneous deck force have shown the most precipitous reduction; officers and midshipmen have achieved relatively more improvement than other groups, but their small number only slightly influence the average rates for the entire service. It will be remembered that during 1911, 1912, and 1913 medical prophylaxis was urged most strongly throughout the Navy generally, and these years coincide with uninterrupted falls in 10 of the 15 groups, and more or less indifferently so in the other 5.

A deep impression or great good fortune seems to have been experienced by young men new to the service during those years, as the rates for midshipmen, coal passers, apprentice seamen, and marines were profoundly affected. The moderate and regrettable reaction already referred to in 1914 may be left to individual officers for explanation beyond the hint given, and also as a sop to those who may think that no one of these variations is greater than has occurred before if only such a table had been published to show it. At any rate, to have the venereal incidence fall coincidentally in all groups during only the years of medical prophylaxis is significant, and an apparent fall of 30 per cent in four years has certainly not occurred before in the last quarter century.

There is in this table very little if any encouragement for the hope that an extension of the Army checkage of pay for disability due to misconduct which has operated against the Marine Corps would, if applied to the Navy, deter its personnel from venereal exposure: the chance of losing a few dollars on account of disability from venereal disease in the Navy is doubtless realized to be quite small; of course

means do all persons expose themselves, but opinions as to the ntage of virtuous vary widely; yet it is seen that only approxi- y one person out of six does become infected and his average lays are only about 14, which would not seem to involve a very fine; so many men will incur vastly greater risks by absence eave to gratify their passions that the fear of loss of pay must to be trivial; should such patients in addition be checked $2 ch sick day for hospital expenses to include all overhead cost, impelled by the strongest human instinct next to the desire e" *might* occasionally think twice before exposing themselves. authorities interpret results of this act as favorable, and of none can assert dogmatically that the admission rates for es would not have fallen but for the loss of pay, yet all other tional groups, to whom the law did not apply, showed similar n better results, and in 1914 the rate for marines was higher t any time before; then again conditions of attending Army and pay may differ in some important respect.

ITO-URINARY DISEASES.—The variation in admission rates for urinary diseases (nonvenereal) appears unimportant except dshipmen, which would be readily accounted for by medical who have had Naval Academy duty; it is suggested that is from swimming pools and circumcision may contribute to twice that of most other groups. However, the death and in- g rates (nephritis) are worthy of notice.

AFFECTIONS.—The most notable variation from the average on rate for eye affections for the whole service (10.97) is o be that for midshipmen (154.60); this rate as an average represents the true conditions because the rate has fallen 17.22 in 1909 through successive years, 286.84, 235.28, 54.01, 20.52 in 1914; this continuous improvement might be partly ed by change of policy on the part of medical officers in ng for record errors in refraction, but more specially ascribed al changes in illumination of quarters to prevent eye-strain inal shock.

halmologists and aurists would doubtless make interesting tations on the distribution of admission rates which concern ecialties, and doubtless some ideas of preventive value would coming.

FFECTIONS.—The high admission rates for ear diseases among ice seamen, marines, and coal passers is largely accounted he fact that the first are all recruits, and from one-fourth to h of the other two groups are within their first years of when old middle-ear disease (prior to enlistment) is apt to attention; to be sure, apprentice seamen are more exposed to nthemata and infections which frequently have middle-ear

disease as a sequel. Personal experience with recruits at recruit depots and on board ship indicates that all too frequently the ear speculum is not invariably used at recruiting stations as prescribed in the Manual of the Medical Department, 1914, paragraph 2076.

MENTAL DISEASES.—An alienist thoroughly familiar with duties of the personnel on modern ships is obviously alone qualified to analyze the admission rates for mental diseases. The relatively high rates for apprentice seamen, fireroom force, hospital corpsmen, and marines suggest not only ineffective elimination at recruiting stations but also lack of mental adaptability to duties and environment: the suicide and neurasthenia rates for the Marine Corps are noteworthy in such consideration, particularly when compared with low rates for apprentice seamen.

The rates for "neurasthenia" vary widely enough to serve some purpose if the assumption is made that psychasthenia is included and doubtless paramount for those four years before the latter term came into familiar service usage. Nerve "tension" and sedentary work without sufficient physical exercise are suggested by the high rates, 8.84 for officers, 4.95 for yeomen, 3.58 for hospital corpsmen, and 3.05 for musicians (foreign element).

CONTAGIOUS DISEASES.—While this class of affections really concerns all medical and administrative officers under whom the personnel comes in contact with the civil population, it is more particularly the problem of training stations and barracks for which the table furnishes little guidance; marines, although somewhat less susceptible through higher age, appear to be far better safeguarded from contagion than do midshipmen or apprentice seamen.

DIGESTIVE DISEASES.—The admission rate for these diseases, has shown wide variation among midshipmen, which has no doubt received due attention from officers at the Naval Academy. From 1909 the rates have been 251, 523, 471, 127, 277, and 334, the last two figures suggesting that the change in milk supply has not accomplished permanent reduction in digestive ailments; for midshipmen this average admission rate is eleven times that of the service at large. The only other unfavorable rate is for officers (52.10), many of whom no longer have to be reminded that their messes on board ship are supported so liberally as to favor obesity and glycosuria as well as digestive disturbances. Voluntary restriction of diet and "Fletcherizing" are each year becoming more common on the part of officers who aspire to something better than plethora after 30 years of service; doubtless elimination has acted, and competition for promotion will continue to act, as spurs for emulation of the lithe and agile. In this connection it should be remembered that the averages for digestive diseases are only for the four years 1909 (35.21) down to 1912 (28.15) because since 1912 a new classification

een used which would be entirely incomparable with the former; g these four years the officers' admission rate steadily fell from to 45.33; of course these drops were too early to be attributed rk of the naval dental surgeons, although it is likely that some should be given to the better attention to the teeth.

sonal experience on three battleships, 1911 to 1914, has drawn the idea that dental and oral hygiene not only favored a re-n in admission rates for tonsillitis and digestive disorders, but the more novel suggestion that careful dental repair dimin-*appendicitis*. Unfortunately the occupational tables for six in the Navy deny this, for the admission rates have risen from 1909 to 6.96, 8.79, 9.78, 9.80, and finally to 16.83 in 1914. The ently high rate for appendicitis, averaging 26.63 for the Hos-Corps, would favor the nonfocal but direct infection theory in nfective environment; but it is certain that hospital corpsmen seized with abdominal pain are more apt to be advised and to ne operation, although the condition may not be more urgent mong other occupational groups not so intimately associated r confident in medical officers and in the elimination of risk appendectomy affords.

DISEASES.—If freedom from cutaneous infections is generally ly proportional to cleanliness, the Hospital Corps, having est admission rate (16.56), is the cleanest occupational group; having the next lowest (19.16) would be consistent with this their work being relatively free from dirt and perspiration; val Academy authorities should flatly reject such a theory ne high average rate of 177.36 for midshipmen. Such items non swimming pool, carelessness in using others' towels, soap, clothes not cleansed from perspiration, infected gymnasium tus and others capable of contagium to common users, would ttention, as it may be assumed that midshipmen are hardly chronic dermatoses.

RATORY DISEASES.—This class will not be discussed generally, llustrate a recent use for its rates the following solicited com-as furnished the commanding officer of a naval hospital which many years been receiving a considerable number of dis-and fatal cases of respiratory disease from a climatologi-favorable naval training station:

The death rate for apprentice seamen (7.58 per 1,000) during rs 1909–1914 is approximately 50 per cent higher than for er occupational group of the Navy, despite their having the vorable age of them all. The average annual death rate for rice at large is 4.33 per 1,000, and, of course, most of the el are older than apprentice seamen. The death rate of the

apprentice seamen has most unfortunately reached 11.57 in 1910. 8.94 in 1913, and 9.25 in 1914.

"2. The death rate for respiratory affections throughout the service (not including tuberculosis) averages 17.9 per 100,000; for tuberculosis it averages 34.5 per 100,000. The invaliding rate for respiratory affections averages 1.42 per 1,000, and for tuberculosis averages 2.55 per 1,000.

"3. The apprentice seamen have by far the highest admission rate for respiratory diseases—103.07 per 1,000—while that for the service at large averages but 22.80. The apprentice seamen average the highest admission rate for tuberculosis—7.04 per 1,000 (as compared with whole service, 5.26)—with the one exception of the Hospital Corps, which is directly exposed and whose rate is artificial on account of practically all on duty at Las Animas during certain years having been admitted for reasons not germane to present conditions. Apprentice seamen overwhelmingly average the highest invaliding rate of all occupational groups, being 108.85 per 1,000, which is over 160 per cent higher (2.6 times as high), than that for marines (41.67), who are commonly considered to be less carefully recruited through less experienced medical examiners.

"4. Apprentice seamen hold their ratings only at naval training stations, where it must be assumed, if, indeed, it is not evident, that their respiratory diseases are contracted. The death and invaliding rates of personnel of training stations are not declared in the geographical tables which the Bureau of Medicine and Surgery formerly published (until 1914), and if they were included they would not begin to show their true value for the reason that a large percentage of their deaths and invalidings occur at and are accredited to naval hospitals more or less remote from the training station, where the focus of incipiency is statistically lost to sight. The geographical tables, however, did furnish much data meriting most careful consideration, and the many times higher 'ratio per 1,000 of force sick daily' of one naval training station year after year, as compared with others, is not the least important and significant example."

INJURIES.—Midshipmen show a very high injury rate (204.52), which could best be studied, explained, and perhaps reduced, by officers familiar with shopwork, athletics, etc., at the Naval Academy. The rates for certain other groups are what might be readily expected from their work, yet they are deserving of study similar to that which has prompted scientific analyses, safety devices, and regulations in industrial establishments generally. The fireroom force shows a rate 100.93, while artificers in the engine room are not quite as prone to injury as the service at large (average rate 83.52).

Electricians enjoy a comparatively low rate (62.87) for service mechanicians.

Malaria.—Except for the Marine Corps (rate 46.11), malaria seems to be a very unimportant source of disability in the service; the question of chronic carriers in barracks and camps on home stations has recently been raised by a medical officer noted for his thoroughness, and may be pertinent in some anopheles-infested districts to which carriers have been transferred from infected stations abroad. The deaths and invaliding rates are negligible nowadays, and it is to be hoped service in Haiti and elsewhere will not prevent their remaining so.

Rheumatic and heart affections.—One would hardly presume to interpret yet the vaguely grouped rheumatic affections, and the organic cardiac lesions largely based thereon, from the loose classification which served the basis for this occupational table, in view of modern revolutionary research as to etiology; it may be remarked that the admission rates closely parallel each other, being high for recruits, coal passers, marines, and apprentice seamen; origin in most cases probably antedating enlistment, except as infections are contracted during the training period. Their respective death and invaliding rates are important and merit intelligent study as soon as fundamental principles are adequately comprehended.

Alcoholism.—Theoretically alcoholism should be the Navy's absolutely preventable disease, and ideally its admission rate zero, so that until it attains that ideal administrative efforts should not rest content. As a matter of fact, however, the naval service should be credited with having reduced its admission rate to a most creditable minimum during the 12 years 1900 to 1912, when it very steadily dropped from 10.75 to 3.89. Since 1912 the rate has remained nearly constant, corresponding to vagrant ne'er-do-wells who must slip into the service under the present methods of appointment or enlistment. The admission rate for officers has of course never equaled the average rate for the service at large, but in 1912 its rate was precisely that for the service in 1911, hence the enlisted branch has by statistics the credit for bringing down the rate.

Disabling indulgence was rarely tolerated among officers after 1902, and steady drinkers of spirits were mostly lost to view. The abuse of beer, and to a less extent wines and cocktails, curiously enough did not spring vicariously from the older officers, but in such places as it did become a nuisance the youthful newcomers to the wardroom were the offenders; these are now likely to reform so far as ship life is concerned, but whether they will find deterring influences on shore appears for the immediate future doubtful.

Tuberculosis.—Certain features concerning this disease have been suggested by rates mentioned under "respiratory disease"; the dis-

couraging fact remains that the average admission rate from 1909 to 1912 (5.26) is that of the previous decade. Damage, death, and invaliding rates vary with administrative policy and are not comparable for this reason. There is little in the table to suggest value in occupational research of the Navy's tuberculosis, the rates pointing to recruiting stations and earlier diagnosis for any practicable solution of the problem.

TYPHOID FEVER.—It must occur to all that average rates for typhoid can no longer be considered representative, but such good fortune could not be foreseen when the table was started. To quote the 1909 report of the Surgeon General of the Navy, page 68: "For the previous 10 years the incidence of typhoid in our service has averaged 4.65 per 1,000 of average strength. This figure is much higher than the incidence per 1,000 in the royal navy for 1907, which was about 1.52. The Navy rate was higher than the average for the previous four years in the United States Army and slightly less than in the royal army. It is higher than among our civilian population generally. During 1908 there was a notable reduction in the number of cases (176, as compared with 249 in 1907), but this reduction occurred entirely in the fleet (57, as compared with 150 in 1907), the greater part of which was making the 'around the world cruise' and distant from the typhoid endemic centers of the Atlantic coast, notably Norfolk, Va. For the whole service the admission rate was 3.3 per 1,000 of average strength, or 2.4 per 1,000 of all persons in the service during the year."

In 1909 the rate was 3.40 from 189 cases with 17 deaths and 10,378 sick days; in 1910 the rate was 3.76; 1911, 4.20; 1912, .92; 1913, .33; and 1914 it had reached .19 from 13 cases, no deaths and 1,027 sick days. Parenthetically it should be stated that there were, during 1914, 9 cases of paratyphoid fever with 355 sick days and no deaths or invalidings. Quadrennial administration of typhoid vaccine is now calling to mind that the beneficent measure was undertaken for the service generally in 1912, the year the rate dropped 78.1 per cent.

MISCELLANEOUS.—The remaining disability classes are either of negligible or declining importance, such as heat affections, which problem has gradually been solved, or hernia; parasites and tumors involve too short a time (two years) and too small numbers for present evaluation. Dysenteric affections are comparatively inconsequential to the service at large, infections being incidental to such varied circumstances of exotic exposure; unfortunately when the classification was made it did not seem practicable to differentiate bacillary dysentery from that of amebic and other parasitic origin.

The death and invaliding rates speak for themselves and, as remarked before, being a consequence of incidence, do not so fundamentally concern the hygienist as they do the clinician.

Interesting and perhaps valuable deductions will occur to any medical officers who may care to run down the columns to learn morbidity risks of certain occupational groups. The only element claiming indulgence here will be the exceptionally favorable sanitary conditions under which naval prisoners serve their confinement. Of course prisoners would be expected to be largely and automatically spared from many causes of disability; it is worthy of note, however, that they enjoy the lowest rates for eye, contagious, digestive, respiratory, rheumatic, heart, and dysenteric affections, malaria, typhoid fever, neurasthenia, and for invaliding from service; their death rate (1.03) is by far the lowest of all occupational groups, and they average no suicides; prisoners also have lowest of all admission rates but one, for parasites, alcoholism, ear affections, hernia, and injuries generally; for the venereal diseases their rate is lowest except for officers and midshipmen; for appendicitis their rate is well below the average, for tuberculosis it is practically the same as for the service at large; for skin diseases hardly more than half the average for the service; but for mental disease prisoners have the highest admission rate except marines.

Total damage and damage rates have been disregarded for present consideration, as have been sick days, invalidings, and deaths, for reasons previously stated. The bottom line of figures does represent the men per 1,000 of each group constantly lost to the service through sick days, invaliding, or death; expressed in per cent it is noted, for instance, that over 11 per cent of apprentice seamen (or 283 of them) are continually unavailable through disability, while, with exception of marines (5.8 per cent lost), all other groups show a loss or noneffective rate less than 5 per cent; the hazard of being an apprentice seaman is far more than twice that of the rest of the service, a fact which, if advertised, would not help recruiting. Prisoners show but 1.6 per cent loss. It will be recalled that these total damage and noneffective rates assume that each death or invaliding is equivalent to half a year's sick days.

EXCLUSION OF THE MENTALLY UNFIT FROM THE MILITARY SERVICES.

By R. SHEEHAN, Passed Assistant Surgeon, United States Navy.

Perusal of the statistical tables presented in the annual reports of the Surgeon Generals of the Army and Navy makes it immediately apparent, that as a cause of nonefficiency and disability in the services, mental and the so-called nervous diseases are far from a negligible factor. In most cases they represent the total loss of the individual, and often a prolonged and therefore large expense to the Government for maintenance and transportation. In addition there is the loss of the money expended in his training, and even the possi-

bility of claim for a pension. Therefore it seems that more decisive measures should be taken to safeguard our military forces from the entrance into them of those mentally unfit, and this term is quite comprehensive.

In the Army during the year 1913 the discharge rate for mental diseases, as is shown below, was higher than that for any other cause.

Disease.	Number of cases.	Rate.	Per cent.
Mental alienation	210	2.57	18.90
Tuberculosis	185	2.26	18.11
Venereal diseases	92	1.13	8.59
Flat foot	67	.82	7.52
Organic heart disease	34	.42	4.04

The admission rate for mental alienation—that is, the amount of nonefficiency—was among white enlisted men 3.49 and among colored 2.59. The discharges for both nervous and mental diseases totaled 285.

In the Army, during 1914, 30 officers were retired on account of disability, making a rate for retirement of 6.22 per 1,000. These included 3 for psychasthenia, 3 for neurasthenia, 2 for epilepsy, 1 for locomotor ataxia, 1 for paresis, making a total of 10, with a rate of 2.07, for these disorders. For the same year the discharges of enlisted men, with the causes, were as follows:

Disease.	Number.	Rate.
Mental alienation	259	2.94
Flat foot	182	2.07
Venereal disease	67	.76
Epilepsy	56	.64
Organic heart disease	47	.53

Mental alienation and epilepsy totaling 315, with a combined rate of 3.58.

In the Navy the disability discharges for nervous and mental diseases were as follows:

1909	130
1910	195
1911	408
1912	431
1913	249
1914	285

The number of patients from the Navy and Marine Corps admitted to hospitals for the insane in years past was as follows:

Remaining June 30, 1907	183
During fiscal year ending June 30, 1908:	
Admitted	86
Discharged	57
Remaining June 30, 1908	212

During fiscal year ending June 30, 1909:

Admitted	130
Discharged	76
Remaining June 30, 1909	242

During fiscal year ending June 30, 1910:

Admitted	101
Discharged	65
Remaining June 30, 1910	260

Beginning in 1911 cognizance was taken only of those men remaining in hospitals who were actually in the service.

During fiscal year ending June 30, 1911:

Admitted	115
Discharged	94
Remaining June 30, 1911	21

During fiscal year ending June 30, 1912:

Admitted	96
Discharged	84
Remaining June 30, 1912	33

During fiscal year ending June 30, 1913:

Admitted	78
Discharged	59
Remaining June 30, 1913	19

During fiscal year ending June 30, 1914:

Admitted	102
Discharged	72
Remaining June 30, 1914	30

Statistics for the entire service for 1913 and 1914 show nervous and mental diseases as follows:

	Admitted.	Died.	Invalided.	Sick days.
Mental diseases:				
1913	285	5	123	18,458
1914	276	3	142	18,205
Nervous diseases:				
1913	454	7	126	20,117
1914	476	7	143	18,355

The total number of sick days for these disorders is only exceeded by syphilis and tuberculosis. The total damage,[1] 235.26, almost equals that due to wounds and injuries, and exceeds that due to diseases of the digestive system, and is almost twice that due to respiratory diseases. It is exceeded only by infectious and venereal diseases.

During the year 1913 there was a slight increase in the rate for mental diseases over the previous year. The rate per 1,000 of those invalided from the service for mental disorders during the year 1913 was larger for the Marine Corps than for the Navy, the rate for the Navy being 1.81 per 1,000 and that for the marines 2.33 per 1,000. About 10 per cent of those admitted for mental diseases during the

[1] Total damage is in terms of individuals whose loss of service by sickness, discharge from service, or death would be represented as continuous throughout the year.

year were surveyed from the service within four months of the time of enlistment.

In 1914 the naval admission rate for mental diseases was the same as the preceding year.

There are at present in the Government Hospital for the Insane, as patients from the Navy and Marine Corps, 27 men and officers on the active list, 10 retired, and 241 who have been discharged from the service; this making a total of 278.

Besides, there are 39 supernumeraries. Of the 27 on the active list, it is considered that in 24 the disability is "not in the line of duty." Two are given in "line of duty," and in 1 this question has not been decided.

It is estimated that of the cases admitted about 54 per cent show predisposition to mental disease prior to enlistment.

As to the form of insanity which service men are most likely to develop the records show that over 56 per cent were diagnosed as dementia precox. That of general paresis was made in about 20 per cent, cerebral syphilis 3 per cent, manic-depressive psychosis about 2 per cent, and miscellaneous in about 20 per cent of the admissions. It is seen immediately that more than half of the cases admitted were of the dementia precox type. This is not surprising when it is considered that the Navy is composed largely of men under 30 years of age, and that dementia precox is a mental disease essentially of the adolescent period.

Because of the marked preponderance of this form of insanity it seems important to consider it more in detail and to endeavor to determine and aggregate the signs that portend the later development of the symptom-complex or group which has been designated dementia precox. This, to remind you, is a progressive, dementing process of a fairly definite and specific character. It shows itself in the end phases in a typical disturbance of conduct based upon the deterioration or destruction of certain basal mental mechanisms. It may be assumed that what we recognize as the disease proper, which from its inception travels a well-beaten track, is made possible by the occurrence of a fairly fixed constitutional make-up or character in those who finally develop the disease.

Bleuler (1) considers dementia precox as a disease without transitions to others, a group of mental diseases which either run a chronic course or occur in attacks. He inclines to the idea that the disease is essentially functional in nature. The process may stop or improve at any stage, but there is perhaps never again restoration to absolute mental health.

The symptoms consist in an alteration of thinking and feeling, and a change of relations to the outer world, a disorder of the asso-

1.—Dementia precox, hebephrenic form. Palatal arch high and narrow. Case No. 21587. (See page 218.)

.—Dementia precox, hebephrenic form, on a feeble-minded basis. Physical and neurological examinations negative. Case No. 21619. (See page 224.)

Fig. 3.—Defective individual, who had a precox episode. Noted: Facial and cranial asymmetry; palatal arch high and narrow; teeth abnormal in form, location, and development; hair brown and abundant, peculiarly distributed in whorls. Case No. 22027. (See page 227.)

Fig. 4.—Not insane. Constitutional psychopath and malingerer. Noted: Physical examination negative except for old ununited fracture of third metacarpal. Case Nos. 20780, 21229, and 21709. (See page 230.)

Fig. 5.—Epilepsy. Noted: Pigeon chest; palatal arch high and narrow. Case No. 21605. (See page 239.)

Fig. 6.—Dementia precox on a defective basis. Clinical diagnosis syphilis. Noted: Lateral right scoliosis; cicatrix on dorsum of penis; cervical and inguinal adenopathy. Case No. 22401. (See page 242.)

Fig. 7.—Chronic alcoholic hallucinosis. Precox reaction in a psychopathic Individual. Physical examination negative except for fine tremors and dilatation of the superficial facial capillaries. Case No. 21574. (See page 245.)

Fig. 8.—Dementia precox, hebephrenic form. Noted: Fine tremors; quite profuse chloasma. Father and one sister inmates of insane hospital. Insane upon enlistment. Deserted while awaiting discharge as undesirable because of inaptitude. Case No. 21361.

. 9.—Constitutional psychopath. Noted: Palatal arch high and narrow; upper and lower eeth notched; physical examination otherwise negative. Morphin habitué, has numerous eedle scars; also alcoholic; has had convulsions. Syphilitic, probably hereditary. Is quarter-ooded Indian. Passed all intelligence tests. Father alcoholic and gambler. Case No. 21142.

.—Defective character, showing episode of excitement. Noted: Father inmate of insane ital; also alcoholic. Parents separated. Patient alcoholic, inveterate cigarette user. Was ously rejected for enlistment because of being underweight and underheight. Cocain ect: habitual devotee of prostitution. Enlisted under alias. Palatal arch high and narrow. No. 21304.

Fig. 11.—Constitutional psychopath. Prison psychosis; not insane. Noted: Deserter. Sentenced to five years imprisonment. Readmitted from prison. Maternal aunt insane. Inmate of insane hospital two years prior to enlistment; also has been in the psychopathic ward of Bellevue Hospital, and in the Manhattan State Hospital, New York. Is macrocephalic. Face asymmetrical. Case Nos. 18902 and 19782.

Fig. 12.—Dementia precox, mixed form. Noted: Marked masturbation without any emotional reaction. Illiterate. Case No. 21439.

ciations and emotional life. There is a tendency to replace or shut out reality with the patient's own imaginative experiences.

Now to consider from our viewpoint the mental and physical features of this type of individual or preceding character. For it is to these that we in our capacity of recruiting officers must look, in order to prevent the admission into the service of those who, unless most carefully treated, are doomed to become mentally involved. We well know that the conditions pertaining in the service are not conducive to mental prophylaxis. If once enlisted these individuals are sure to go along uninterruptedly toward the catastrophe.

Dementia precox has been regarded by many writers as nothing more than a generalization, or group of disorders, into which has been placed for convenience of classification a number of similar conditions. However, if not an entity, these cases are all some sort of a mental disease having its onset in adolescence or early adult life. There is getting to be less doubt that there is a fairly definite pathology underlying these cases. Still there is not a uniformity of opinion regarding this question. Adolf Meyer (2) contends that the disease is possibly but "incidentally organic." In 1910 Southard (3) showed that a vast majority of cases of dementia precox were characterized by coarse anomalies or scleroses in particular regions of the cerebral cortex. These areas seemed to determine the character of the signs and symptoms displayed. Paranoid and catatonic colorings are associated with lesions predominantly in the frontal and parietal regions. Lately (4) he reported another series of cases, which he believes goes very far toward placing dementia precox in the structural group of mental diseases. There is a marked tendency for the process to become diffused and invade the entire cerebrum, so that to the more striking mental symptoms are added physical signs which are fairly definite.

Necessarily the clinical picture will vary according to the anatomical localization of the process. The course will also vary, and the end level will be reached, largely according to the more or less general diffusion of the process and the areas of special predilection.

It is not determinable whether the lesions presented are of a congenital or acquired nature. However, it is more than likely that the potential victim of dementia precox is born with the normal stock of brain cells, but their arrangement and development are at times early interfered with. It is not entirely valueless to consider these cases as the result of faulty adaptation to environment, and while not causative this may be the determining or precipitating factor.

This idea of an exact pathology has not been accepted by a number of authorities, who, like Bleuler, adhere to the functional theory to a greater or less degree. Still the pathologic findings are there, and

they no doubt represent atrophies of unused association tracts, which have resulted from the fixation of pernicious habits of mental development.

Of late considerable attention has been given to the intoxication theory of the production of the disease. Holmes (5) believes that it is due to the presence of certain toxic amines of a biochemical nature which have a pressor action. The blood pressure in these cases is always below normal and can not be raised by adrenalin injections. These toxic bodies are no doubt due to a malmetabolism of the internal secreting glands. This may be due to an abnormal, nonfunctionating, or degenerative condition of the genital glands, or an involvement of the thymus or pituitary body. That there is a destruction of gland tissue seems unquestionably substantiated by the use of the Abderhalden reaction (6).

It is probable that the lesions found are due to some toxic agency, the source of which investigators seem in a fair way to determine.

While these theories regarding the genesis of the disease are interesting to us, they are not as important from our viewpoint as are the etiological considerations, for these may enable us to exclude the potential dement. We must consider the make-up of the individual, the heredity, the ancestral features, and the environment.

At to make-up, their early history will show symptoms that develop in childhood as a result of overwork plus other factors. In the predementia period there is a pathologic tire, an unnatural fatigability, anxiety, changes in mood, sudden rudeness, excessive selfishness, irritability, peevishness, and quarrelsomeness. These are the precursors of the frank mental tire indicating the disease. The amount of mental work is of less importance than the method of acquirement. It has been shown that when an ill-directed ambition has stimulated children of physically poor rural parents to take up intellectual pursuits in cities, dementia is not an infrequent result. They do not seem able to resist the effects of the strenuous competition, reversals, and disappointments of city life. This is well shown in the following case from our series:

M. W.—Hospital No. 21587. (See fig. 1.) White male. Age 23 on admission September 9, 1914. Summary of family history: Father alcoholic; mother asthmatic; one brother died of injuries received in a saloon brawl, also alcoholic; one younger brother alcoholic. Personal history: Born in Germany, brought to this country as an infant. Birth and development normal. Attended common school until 14 years of age. He then went to work in a cigar factory at \$1.50 per week. Remained there six weeks and then worked in the Wabash car shops for 2½ years at \$45 a month, at different times receiving \$60 a month. Having saved up some money he decided to go to school, being encouraged to do this by the congregation of the

rch he attended. They wished him to study for the ministry, as was regarded as being exceptional. He went to college, where he eavored to do two years' work in one. It was considered by the hing staff that he was undertaking entirely too much. He re-ned one term, when he began to realize that he could not do the k, so he ran away. He gave as an excuse that he wanted to go e to protect his mother, who, he understood, was being abused is father. He endeavored to secure employment but was unsuc-ful. Therefore, he decided to enlist in the Navy, which he did ch 4, 1914. He was sent to the Naval Training Station, Norfolk, e he seemed to get along all right for three months. However, as regarded as seclusive and peculiar. His present illness be-in May, 1914. He believes it was due to the fact that he could get his mind on anything but conditions at his home. Thus sed, he deserted, and hoboed his way as far as Fort Wayne, Ind., ould get no farther, so gave himself up to the naval authorities, returned him to Norfolk. He was recommended for a court-ial. While awaiting trial he ran away and managed to reach ome. He was there only one day when he was arrested by the authorities and remanded to Norfolk. As his actions were as somewhat peculiar he was placed under observation by edical officer. He was transferred to the naval hospital, and a few weeks to this hospital.

on admission he was well oriented, contented, had good insight, well, no hallucinations or delusions could be elicited. Speech al. Memory good. Associations and special tests well done. as attentive, but during the examination displayed considerable on and continually wrung his hands. Physical condition was His conduct was not unusual. He was rather seclusive, rent, and somewhat retarded. He denied that he had ever had inations. He continued to improve gradually. Took more st in his environment and expressed a desire to get well.

was discharged in December and allowed to go to his home. s advised to content himself with some rural occupation.

r cases will show day dreaming without efficient activity, an rated ego-complex with maladjusted attempts at compensa-nd particularly prominent, the emotionally accentuated love-x.

r (7) has described what he calls the deterioration type, stat-at in dementia precox he repeatedly finds a history of ex-y childhood with a gradual change at the period of emancipa-Close investigation may show, however, that the exemplary as an exemplarily inadequate ideal, an example of goodness ekness, rather than that of strength and determination, with ncy to keep good in order to avoid fights and struggles. Later,

religious interests may become vivid, uncontrollable whims may make their appearance. At home irritability shows itself. He may often be wrapped up in moralizing over the easy life of brothers and sisters. Abnormal sensitiveness drives the patient into seclusion. There occur headaches, freaky appetite, general malaise, hypochondriacal complaints about the heart, then there will be unsteadiness of occupation and inefficiency, day dreaming, and utterly unnatural philosophizing, and above all, loss of direction, energy, and activity without obvious cause. All these traits may be transient, but they are more than a mere "neurasthenia," usually being the beginning of a serious deterioration. This is more and more marked by indifference to the emotional life and ambitions, and a peculiar fragmentary type of attention, with all the transitions to the apathetic state of terminal dementia. Those who later develop the abnormal reaction of dementia precox are the peculiar rather than the defective. In the sense we have in mind they are those addicted to repressive rather than aggressive mischief. This may often be characterized as depth of thought. Those affected are the very children a former generation might have looked upon as models of behavior.

In dementia precox we have to deal with a perfectly natural, though perhaps unconsciously persistent, development of tendencies difficult to balance. The common inclinations of adolescence, such as the reading craze, day dreaming, or abnormal sexual practices, are offset in the more natural and sociable children in one way or another. In these types, however, the very bad habits of the patient, the loss of the sense of reality, and the abnormal satisfaction in dreaming, as well as the good resolutions made, merely encourage a dodging of the consequences rather than the giving up of the harmful instincts. Those who fail are irritated by their disadvantages as compared with others, and try to cover up rather than correct their pernicious yearnings. They develop an insidious tendency to substitute for an efficient way of meeting the difficulties a superficial self-deception and a habit of drifting into many varieties of shallow mysticism and metaphysical ponderings, or fantastic ideas, which can not possibly be put to the test of action. All this is at the expense of really fruitful activity, which tends to appear to the patient as insignificant compared with what he considers loftier achievements. There is an ever widening cleavage between the mere thought of life and the life of actual application, such as would bring with it the corrections found in concrete experience. Then, under some strain, which a normal-minded individual would be prepared for, a sufficiently weakened and sensitive one will react with manifestations which constitute the mental disorder or deterioration process which we denote dementia precox.

nfinished or chronically subefficient action, a life apart from esome companionship and concrete test, finally a progressive inruity in meeting the inevitably complex demands of the higher acts—this is essentially the formula of the process.

e natural and almost normal tendencies gradually become abal. This emphasizes the necessity of getting full and circumial histories of all cases. Note whether the subject was able to dequately small demands and did he fail under the heavier ıs. If so, under what stress did he have difficulty in transmuting hts into action?

portant are the specific defects or disorders of balance maniby special tendencies and habitual ways of bungling and subon, the gradual maladjustments, that come about through the ncreasing influence of these at first harmless substitutions and fuges, which are later harmful and uncontrollable. Hoch's (8) the "shut-in" personality, is especially descriptive of these duals. Where a breakdown or marked reaction has once set s very difficult to bring relief directly. The fundamental shutn of the whole mechanism enables the preoccupations to live elves out and exclude interventions. Automatic resistance t the most natural impulses frustrates even the occasional ic spontaneous appeals of the subject for relief. The paranoid t particularly has been rather brilliant, but with the lights in instead of outward. They are extremely impracticable in e of their hands or in any adaptation to material ends. Thus ual to find that they are never successful at mechanical trades. y are utterly unable to observe with accuracy anything physical terial, because their minds are constantly occupied with their editations. They are unready to adapt themselves to unconemployment or environment, not necessarily including personal t, as this they often ignore. They revolt against the control er minds, of imposed regulations, or standard requirements. line is odious. They are subject to fits of abstraction, when ill not see or hear what would attract a normal youth. They ually irritable to their families, but most desirous of being t amiable and brilliant by strangers. They are abnormally e and suspicious and prone to discuss deep or unsolvable ns.

will readily see that this type of individual is the one who of his peculiar make-up is likely through trouble at home, issatisfaction, or imaginary grievances or unrequited love to drift to a recruiting station as a possible means of escape ese conditions.

the mental side the history is most important. A conion of the early life of the candidate, his progress at school,

his adaptability to occupation, whether he was quarrelsome, unsociable, in trouble continuously, dissatisfied with his surroundings, whether he has wandered about as a hobo, frequently idle, arrested, and confined in jails, workhouses, or reform schools. Here may be cited in brief two cases lately under observation, one an electrician, third class, who was in the service less than a year and who, because of his inadaptability, did not receive promotion as rapidly as he deemed deserved. He became sullen, morose, irritable, seclusive, imagined that he was being persecuted by his superiors. He was unable to sleep, and was found wandering about the ship at night. He threatened to throw himself overboard. Finally he gave vent to his feelings by pounding the dynamos with a hammer. His previous history was one of an unhappy home life, trouble at school, wandering about from place to place, and from one occupation to another, ending with a decision to enter the Navy, because he imagined that would take him away from all his troubles. In this you will recognize a typical paranoid dement.

Another case gave a previous history of an unsettled and vagrant existence, also with entrance into the Navy to escape, as he believed, from his unhappy condition, who, in less than a year, driven to distraction by the gibes and tormenting of his shipmates because of his slovenly habits and eccentric manners, in a moment of frenzy stabbed one of them almost fatally.

Much valuable information can be elicited in a consideration of the heredity. This factor has received considerable study. In a series of 647 cases, at the Bergholzi Asylum, in Zurich (9), 90 per cent showed hereditary taints, and the most important of these were mental diseases, which were shown in 64 per cent.

In a series of 550 cases in the New York State hospitals, 90 per cent showed heredity of some sort.

The 528 navy admissions in the period from January 1, 1899, to January 1, 1910, gave a definite history of mental or nervous diseases in 101 cases and a vague history in 34. (10)

Of the forms of mental disease in the ancestry, dementia precox itself is the most important.

Hickson (11) in observation of a thousand cases found that there was not one case in which there was not a well-defined heredity of this psychosis, and he claims that dementia precox is always hereditary.

However, the bearing of other diseases must not be lost sight of.

Next to mental disease, the most emphatic element in the heredity is alcohol, and in the above-quoted series of 528 cases this was definitely shown in 74.

Abnormal characters appear in the antecedents in a very large percentage, 33 per cent, and neuropaths in 59 per cent. These appear

th in the direct and indirect lines. Some of these were no doubt relicts, themselves suffering in all probability with some slight m of dementia precox, coming on later in life or as the residual apidation resultant from an early attack of the same disorder. ny of these are also in the alcoholic class, since with the advent manhood they sink in the struggle for subsistence and are the semi-lures in life, those pushed aside and forced to be contented in ng out an existence. It is this class that contributes the majority the precocious dements to the population. Especial stress may be d on the unnatural fatigability of these individuals which is in-ed by intellectual strain, abetted by abnormal sexual life or holism, which in itself is a symptom of profound "neurasthenia." hilis *per se*, or as tabes or paresis, is not infrequent in the parents. Ve have been particularly impressed with the importance of ital incompatability in the parents as a factor in determining the t of precox. There has been an inability of one or both to adapt nselves to common-sense relations. This results in discord in home life, oftentimes to the family being disrupted and the lren placed in institutions. The only child seems to be a special rer from the engendered tension. In the Domestic Relations rt of Chicago, of a group of 342 cases examined, 71 or 20 per cent, found to have dementia precox, which shows what an important this psychosis plays in domestic disturbances.

THE FEEBLE-MINDED.

nder this caption should be included only those individuals who deficient in the sphere of intelligence. It is this type that often es as the basis upon which dementia precox is grafted. In a p of 789 cases of high, middle, and low grade defectives, 94, or r cent, were found to have this psychosis.

course only the milder grades of feeble-mindedness should cause liagnostic difficulty. It is a common experience in the service to nen who are physically desirable, but mentally unfit; men, who gh their inefficiency and misdoings are sources of annoyance, se, and even danger. Their work is poorly done. They are stworthy and unreliable. They take up the places of valuable duals. Besides it is a waste of time and effort for an officer leavor to teach an imbecile, who is perhaps predestined to a al for mental diseases.

s only the fundamentally abnormal individual whose mentality es impaired under the stress of service conditions in the first or four months of his enlistment. A normal individual has a rful power of adjustment and adaptability to almost any en nent without showing any mental impairment. So in the last sis it is the individual with whom we have to deal rather than

the environment, change of which only serves to bring about the mental reaction.

In the elimination of the feeble-minded great assistance was expected from the use of the Binet-Simon scale. However, it has not been found that this, in its present form, is adaptable to service use. Its limitations and imperfections have been considered previously (12). The high-grade defectives, which really are the only ones that come seriously to our attention, evidently need other methods. This has been so well realized that there is no doubt that some such assistance will soon be available, as the matter is receiving attention from workers throughout the country. This perhaps will be in the nature of visual memory and performance tests with modifications to show emotional reactions. To date none of the mental tests adequately estimate the capabilities, and these are what we are interested in determining.

Of more value is the knowledge of the reactions of the subject to his environment. A cross section of his career will give us the most valuable data on which to base his exclusion.

The feeble-minded are not inherently antisocial, but being suggestible and unable to control their actions because of defective perception, reason, and judgment, they become the unconscious tools of others. They are subject to attacks of depression and exaltation. Being unstable the baser elements of their natures assert themselves at these periods.

The following case is a good example of this class of defectives:

S. G.—Ordinary seaman, United States Navy. No. 21619. (See fig. 2.) White male. Age 21 years on admission September 21, 1914.

Family history negative. Personal history: Patient states that he was born in Colgate, Okla., April 4, 1899 (this is incorrect). Later says it must have been 1889. When questioned he is unable to compute the year of his birth when given his age. Because of the patient's very limited intelligence his history as obtained is unreliable and manifestly incorrect. He did not get much schooling, went about two years in all, and says he was in the third grade when he left. He then went to work in a coal mine, his father having told him he would either have to work or leave home. He ran away from home and enlisted in the Navy at Oklahoma City January 26, 1912. He was sent to the training station, San Francisco, where he remained six months, and was then transferred to Bremerton, Wash., where he remained a year. He then went to duty aboard the U. S. S. *Galveston*, on which ship he remained about eight weeks, when he was transferred to the U. S. S. *Pampanga*, where he remained about three weeks, when he began to manifest mental symptoms and was recommended for transfer to the Mare Island Hospital, where he remained four days before being sent to the Mendo-

cino State Hospital, from which place he was sent here. Patient does not think he is ill either mentally or physically. He denies the excessive use of alcohol; says he never had any trouble in the Navy, but he does not like the service.

Present illness: Patient states he was not ill mentally or physically, but one day did not feel very well, and when the officer told him to work he refused, and says on that account he was sent to Mare Island. He says the only trouble he ever had was for refusing to sign the pay roll because a safety-razor had been stolen from him. He did not think this was a peculiar attitude to take. He denied all hallucinations.

The medical certificate states he used alcohol moderately, mental capacity only fair. First symptoms began on the U. S. S. *Pampanga* about December 1, 1913, when the patient was noticed acting peculiarly. He would not do his work and was markedly inattentive. The onset was gradual. He showed impairment of mental faculties; his attention was hard to retain; ideas were confused; retardation prominent. It was stated that he refused to eat or attend to himself.

Mental examination showed the patient to be fully oriented in all spheres. Emotionally he was contented, slept well, dreamed occasionally, but the dreams were of no import. He had very little insight into his condition, did not think there was anything wrong with him. He could not give the cowboy story. His special memory was meager. He was unable to perform the Masselon or Ziehen tests. Calculations were all incorrectly given. He was unable to name the months correctly backward, but managed to give them forward after considerable hesitancy. He had almost no general information, and a very limited knowledge of current events. He was entirely unable to respond to the Finchk test. His ethical reactions were normal.

Physical and neurological examinations were negative.

He appeared to be somewhat retarded and did not make a normal impression. His conduct following admission was good, and he was placed at work in the dining room. He became fairly well interested in his surroundings, and was neat and tidy in personal appearance and habits. He now stated that he was not certain whether he had heard strange voices previous to his admission here or not. He continued to work in the dining room and was fairly efficient, although he was rather childish and could not answer any of the intelligence tests. He was unable to write his name and could not read. The tests that he was able to comply with showed that he had a basic psychological age of 8. He was continued in the hospital until February 9, 1915, and as he did not display any evidences of a psychosis he was discharged into the care of his father.

PSYCHOPATHIC CHARACTERS.

Under this heading may be considered the individuals who are "failures of mental adaptation." They have, as an essential, a mentality which deviates from the normal. If looked at from the purely social point of view they would all seem to be defectives. However, examination shows that at the most but 30 per cent can be included in this category. This leaves a group that is important, including those who are not feeble-minded or insane but who are clearly abnormal mentally. Here may be included the so-called defective delinquents, the moral imbeciles, the constitutional psychopaths and inferiors, and the pathological liars and swindlers. The defective delinquents do not give evidences of mental defect, but their conduct is abnormal. They are antisocial, and display certain character defects. They are impulsive, vehement, emotional, and inhibitionless. They are easily unbalanced, and thus liable to social difficulties in a complex environment.

The moral imbeciles comprise a group of those psychologically of unsound mental temperament. They are without any moral sense. Destitute of even the possibility of moral feeling, they are truly insensible to the moral relations of life, as deficient in this regard as a person who is color blind is to certain colors. Although it is usual that they have more or less acuteness of mind, in some instances there is a remarkably acute intellect of the cunning type. They are usually burdened by heredity. Many are ignorant, but others may be highly educated.

Constitutional inferiors (13). These individuals are not strictly feeble-minded, but present physical abnormalities combined with a mental equipment which is not equal to the strain imposed by ordinary social conditions. They are unable to occupy their places in society.

Physically they may show markedly delayed signs of puberty, infantile form of torso, weak and flabby muscles, stigmata of degeneration, such as facial and cranial asymmetries, palatal and dental abnormalities, peculiarities of the external ear, polydactylism, etc. They may exhibit tremors, facial and other tics, nystagmus, migraine and vertigo, a history of enuresis in childhood, which may persist. Defective vision, pigmentation of the irides, malformations of the genitals, weakness of the ocular muscles, and a peculiar gait are frequent. Stammering occurs often.

Mentally there is indecision, moodiness, irritability, violent temper, instability, and vacillation. Dependence is prominent. They readily adopt every vice, prostitution, alcohol, and other drugs. Their mental operations are slow. Reason, judgment, and attention are defective. They are impulsive. They crave continual and unusual

xcitement; this often leads them to criminality. They are impelled o travel, and thus become hoboes. The following case is quite escriptive:

A. A. K.—Apprentice seaman. No. 22027. (See fig. 3.) Age 8 3/12 years. Nativity, Wisconsin. Education, practically none. dmitted May 10, 1915. Medical certificate states: Father was a ronic alcoholic. Patient was wild and headstrong. Was under o restraint. Was religious, talkative, egotistical. No history of revious attacks. First symptoms of the disease became manifest hile on sick list with bronchitis. Began annoying the other paients and nurses by interfering with the treatments. Developed elusions that the nurses were old friends of his prior to enlistment. ad a number of altercations. Previous to becoming sick had been garded as queer and inquisitive. He is assertive, noisy, and anying; kicked one of the nurses on the shins, as he says, to show s friendship. Also believes that the hospital corpsmen were civil gineers on a railroad with him prior to his enlistment. Is raming in his conversation. Probable cause, defective basis.

Status on admission: Patient is hyperactive, volunteers considerle assistance in the ward, but is inclined to interfere and assert his n peculiar ideas regarding the work. He has an exaggerated a of his own ability. He is talkative, telling about himself d his great accomplishments. Conversation is irrelevant. He is ndiose, restless, and appears to be of a low grade of mentality.

Family history: Father and mother were divorced 17 years o, due to excessive alcoholism on the part of the father. Since it time he has not heard anything from his father. Patient is only child.

Personal history: States he was born in Wisconsin January 30, 97: is now 18 years of age. Had very little schooling; then went work on a farm, where he remained with practically no associate his mother until he enlisted in the Navy October 29, 1914, at neapolis, Minn. He was sent to the Great Lakes Training Sta-, where he remained until sent to this hospital. He acknowledges uent masturbation.

resent illness: Patient states he was always much interested in ing pictures, and that he liked to write plays when he was at ol, so he wrote a play which he gave to the lieutenant. Shortly r that he got sick and they sent him to the hospital, which he eves was due to studying too hard over this moving-picture play. lental status: Stream of talk free, relevant, coherent, and rather umstantial. His only complaint is overstudy. Emotional status: ient is quite euphoric, well satisfied, says he has never been ted better in his life. Is under the impression he was sent here art of his duty as a sailor. Says he never had any trouble. No

hallucinations or delusions can be elicited. Orientation is good, as is his memory for remote and recent events. Insight and judgment are entirely lacking. He does not seem to appreciate that he is regarded as mentally defective. He appears unable to give the emotional value to events, or the real politic value to circumstances of his life. Habits and character: A greater part of his life he lived on a farm with his mother, who had considerable influence over him, and his horizon seems to have been bounded by her training, and his opportunity to compare his ideas of his surroundings with the reality of his existence has been limited. His first real contact with the outside world was when he was sent to the training station at Great Lakes. He was entirely unable to appreciate his status, or the value of his surroundings, and as a result overreacted. He seemed to appreciate somewhat that his difficulties were not due to outside influences entirely but were partly due to himself, and his difficulties have arisen from the fact that his experience has been entirely too limited to enable him to properly interpret his social relationships. His special memory is good. The intelligence tests were quite well done. The Ziehen test was done fairly well. He comprehended the Finchk test. The cowboy story was well repeated. Forward and backward associations were correctly performed. His ethical reactions are apparently normal. He has a good knowledge of current events. Calculations were quite well done, in multiplication and addition, and fairly well in division, but very poor in subtraction. He was unable to perform the 50-cent problem.

Physical examination: Head asymmetrical. Peculiar distribution of the hair. Difference in the formation of the ears. Palate is high arched, teeth misshapen and poorly kept.

Diagnosis: A precox episode in a defective individual.

THE CONSTITUTIONAL PSYCHOPATHS.

This group is neither sane nor insane. They are borderland cases that show an inefficient type of adjustment. They have a fair amount of intelligence, comparable with their station in life. They are cool and calculating, deliberate, indolent, superficial, very selfish, egoistic, and cruel. They are strongly individualistic, being nonsocial, which is due to lack of proper influences at their developmental period. They show varying degrees of adaptability for certain periods. Usually they are emotional, and show eccentricities of character and behavior.

Their make-up favors the development of psychoses. Even in childhood they are considered queer, dull, and different. Later they are one-sided, impulsive, unstable. They are hyperquantivalent, inclined to magnify trifles, visionary, exalted, conceited, pessimistic, and prejudiced. They have little creative imagination, and rarely

ıe application of what they learn. They are dull of comprehen- sensitive, distractible, shy, secretive, timid, introspective, over- ientious, suspicious, seclusive, indecisive, erotic, inclined to lying heft. They may be geniuses in music or display mathematical .

PSYCHOPATHIC LIARS AND SWINDLERS (14).

s often that this class of individuals causes trouble in the serv- false accusations and irregular practices. This pathological is falsification entirely disproportionate to any discernible end w, engaged in by a person who at the time of observation can e declared psychotic, feeble-minded, or epileptic. Such lying , if ever, centers around a single event. Although exhibited in ccasional cases for a short time, it manifests itself most fre- y by extending over a period of years or even a lifetime. It ents a trait of character rather than an episode. Extensive, omplicated fabrications may be evolved, hence the synonyms— mania, pseudologia phantastica.

ıological accusation is false accusation indulged in apart from s purpose that is of advantage to the individual. It is easy how such a person in his effort to make himself conspicuous, atisfying his grandiosity, may cause serious trouble for those hom he is associated. In particular we recollect one such case an officer was subjected to considerable humiliation in being ed by such an individual.

e subjects are invariably egotistical, grandiose in manner, self- d, and these characteristics are reflected even in their conversa- hich tends to be circumstantial and self-laudatory.

PRISON PSYCHOSES.[1]

term (15) has been applied to the group of psychotic com- which can not be satisfactorily classified under any of the terms used to denote mental disease entities. They show r symptoms that the disorder is the result of a psychogeneti- oked complex of a purely reactive nature. They are to be upon as merely the reactive manifestations of a particularly osed mental make-up to certain specifically unfavorable en- ental conditions. The term is of value as it emphasizes the c potential of imprisonment, as a provocative agent in the on of psychotic states requiring hospital care. These con- occur in individuals who have apparently been normal in ee life, but who, as soon as they are placed under the restraint on regimen, show their incapability of adjusting themselves

ion is called to an abstract of an article upon malingering by Glueck on this number.

to its restrictions. Their response is an overreaction. We have seen prisoners brought here as insane who, almost as soon as they were placed in the ward, ceased to show any psychotic symptoms, but would do so as soon as they were returned to prison. This sort of a condition always suggests malingering, but this element is not as frequent as one would think. These individuals present a problem, as it is difficult to decide under our present system the best way to handle them. In prison their reactions are of an insane nature and decidedly abnormal, and when they are sent here they fail to show any psychotic symptoms. The best solution seems to be the providing of a psychotic ward in the hospital attached to prisons, where these prisoners can be placed until they reach an adjustment, thus avoiding the large expense involved in transferring them back and forth between prison and insane hospital.

The following cases are familiar to many naval medical officers and are good examples of the perverse characters described above.

H. J.—Apprentice seaman, No. 20780, No. 21229, No. 21709. (See fig. 4.) White male. Aged 27 years on admission November 13, 1914. Education, fifth-grade grammar school. While serving a year's sentence at the Portsmouth Naval Prison for fraudulent enlistment the patient told the authorities there that on August 7, 1909, he had murdered a girl in Rochester, N. Y. He described the murder in great detail; stated that he met the girl in one of the Rochester cemeteries and attempted a sexual assault upon her, and when she resisted he choked her to death. He stated that he did not mean to kill his victim, but that he had inflicted the fatal injury before he was aware of it. He said that it was remorse and the desire to expiate his crime which prompted his confession. He persisted in this confession until the naval authorities were persuaded to discharge him and turn him over to the civil authorities of Rochester, N. Y. Upon arrival there an alibi was easily established, freeing the patient of all suspicion of the murder. It took a good deal of investigation on the part of the authorities to establish the patient's real legal status. It was finally decided that he belonged to the naval authorities, and he was accordingly returned to prison and was given an additional sentence of a year for this fraud. He began to serve this time on December 13, 1909. While awaiting sentence he assaulted a master-at-arms, whom he claimed abused him. For this offense he received an additional five years' sentence. He served this sentence until his first admission to this hospital on July 16, 1913, on the following medical certificate: "First symptoms became manifest in 1910. Patient showed fixed delusions of having murdered a girl on August 7, 1909. Present symptoms: Fixed delusions of a self-accusatory nature, delusions of persecution, accused a medical officer whom he had never seen before as being

among those who were hounding him. Becomes excited, violent, profane, incoherent, and obscene in speech, and attempted to assault this officer. He attempted suicide on February 15, 1910, while at Concord (N. H.) State prison."

During the patient's first sojourn at this hospital he conducted himself in an orderly manner, and aside from the expression of mild persecutory ideas with reference to the prison personnel he was free from psychotic manifestations. On only one occasion was he involved in any trouble here which was entirely his own fault. He was discharged on September 28, 1913, with a diagnosis of "not insane, constitutional psychopath," and was returned to the Naval Prison, Portsmouth, N. H.

He was readmitted here on March 15, 1914, on a medical certificate which stated that "the patient said he snuffed cocain prior to admission to the Navy, and that the murder he believes he committed was done, according to his statement, because of the refusal of the victim to permit sexual intercourse. The patient has at present the same fixed delusion of having committed this murder in 1909. Wants to expiate his crime to escape those who are continually hounding him. When irritated he flies into a rage, cries, tries to do himself injury, and talks incoherently. While working in the yard, for no cause at all he struck a fellow prisoner and pursued him with a shovel. During maniacal attacks he can be restrained with difficulty, smashes furniture in his cell, and is slovenly in habits. He complains constantly of numbness and needlelike pains in the vertex of the skull. Probable cause—prison routine."

It will thus be seen that the same fraud about the murder, which served at one time to bring him an additional sentence of a year, was considered at another time one of the symptoms which justified his return to this hospital. The patient's version of the reason for his return is as follows: Soon after his transfer to Portsmouth the guards began to annoy him, calling him crazy guy, hard guy, etc. He also got into trouble with the sergeant because the latter cursed him. He began to express the same ideas about the murder and thought this was the reason they sent him back.

Mental examination and physicians' notes made during his second admission showed no gross psychotic symptoms. He still maintained that he had actually committed the crime in Rochester and related it in great detail. He stated that while he was confined in Portsmouth prison he became remorseful over this crime and decided to confess. His conduct here was exemplary. He appeared at the staff conference on April 20, 1914, and a diagnosis of "psychopathic character" was made. At this time it was extremely difficult to pick out the true from the abnormal elements in the patient's story, and there were a great many things in the general emotional reaction of

the patient that fitted into this story. The patient seemed to have a sort of determination to get into difficulties for the sake of posing as a martyr, and all this fitted in with the grandiose element of his character. Being oppressed, he had taken a way that was very satisfying to his feeling of importance. Later during his sojourn here the patient became rather anxious to be returned to prison, stating that he had given up all the ideas which he had expressed on admission, assuring the examiner that he had malingered on both occasions of his transfer to this hospital. He stated that his chief anxiety, which caused him to malinger, was the fear that he might be given additional sentences because of his inability to get along in the prison, and he thought the only way to avoid this would be to be pronounced insane. Patient was discharged from here and sent to the naval prison, Norfolk, on July 9, 1914.

He was again readmitted to this hospital on November 13, 1914, on a medical certificate, which stated: "Diagnosis, constitutional psychopathic state, not in line of duty. Existed prior to enlistment. He was in the Government Hospital for the Insane in Washington for about four months during this year. His condition is not improving. A few days ago a sudden outburst occurred and he has been in close confinement since. He struck a recruit, and after being placed in a cell destroyed a chair, and had to be restrained. It is considered that his retention in the prison at this barracks is not desirable."

Nothing essentially new developed in the case during this admission. The patient was from the first quiet, well-behaved, a willing worker in the industrial department, and free from any signs of mental disorder. Of course, he again blamed the guards at the prison for the trouble in which he became involved and which necessitated his third admission to this hospital. A letter received from the naval medical officer stationed at the marine barracks, Norfolk, Va., the place of the patient's last confinement, was to the effect "that while under observation there the patient made the impression of being a good worker and normal in every way, except that he had a quick temper, and that the only difficulty they noted was on the occasion when he assaulted the man at the prison who appeared against him at the mast, and that after this scene he was put in the brig, where he threatened to kill any —— —— man who came near him."

The medical officer was impressed with the fact that the patient was feigning insanity.

The patient's version of the circumstances which led to this last admission is about as follows: He was reported to the commanding officer by a guard for some alleged minor infraction of discipline, of which he claims not to have been guilty. After the guard was through making his report the patient asked the commanding officer

Fig. 13.—Dementia precox, hebephrenic form, on a feeble-minded basis. Noted: Well nourished. Posture awkward, somewhat stooped. Pigeon chest. Cranium small and rather recessive. Facial asymmetry. Palatal arch high and narrow. Masturbates publicly without any emotional reaction. Attempted suicide at training station. Case No. 21675.

Fig. 14.—Psychosis associated with organic disease of the brain and syphilis, and occurring in an individual of the precox type. Is alcoholic, sexually perverse, and with old cicatrix on penis. Case No. 22321.

Fig. 15.—Dementia precox, hebephrenic form, in a psychopathic individual. Noted: Underweight; cranium small and asymmetrical; forehead recessive; nasal septum deflected; palatal arch high and narrow. Acknowledges habitual masturbation, also incest, bestiality, and both active and passive pederasty. Case No. 21614.

Fig. 16.—Not insane since admission. Probably psychotic episode in an inferior individual. Noted: Undernourished and underdeveloped. Palatal arch high and narrow. Orphan at 5 years of age. Deserter. Hysterical episode. Showed psychotic reactions as a result of his inability to adjust himself to service conditions. Case No. 21586.

Fig. 17.—Dementia precox. Noted: Patient in psychopathic hospital prior to enlistment. Alcoholic. Gonorrhea prior to enlistment, discharge present on admission. Stole $60 and enlisted to "get away." Determinants of attack, venereal disease and inadequacy to service conditions. Case No. 21950.

Fig. 18.—Dementia precox, in a defective individual. Noted: Alcoholic, marked hepatic hypertrophy. Seclusive. Speech defect. Always inadequate. "Neurasthenia" in 1911. Heat exhaustion in 1912. Case No. 21758.

Fig. 19.—Dementia precox, catatonic form. Noted: Height, 63½ inches; weight, 108 pounds. Palatal arch high and narrow, external ears low placed. Habitual masturbation. Active and passive pederasty. Self-mutilation of penis. Case No. 21342.

Fig. 20.—Undifferentiated psychosis in a defective individual. Noted: Father alcoholic and diabetic. Patient could not speak until 5 years of age. Attended school until 15 years of age and only reached the fifth grade. No regular employment, always incompetent. Illiterate, can not write own name unassisted. Physical examination negative. Determinant, nostalgia. Case No. 21628.

Fig. 21.—Syphilis (cerebral). Noted: Father alcoholic. Parents separated. Head injury in childhood; scalp shows cicatrix over vertex. Palatal arch high and narrow. Sent to reformatory at 15 years of age, later became a "hobo." Enlisted in December, 1913; deserted after seven weeks. Mental symptoms appeared in August, 1914. Attempted suicide. Denies syphilis; Wassermann reaction + + + . Case No. 21622.

Fig. 22.—Paranoid state, in a defective. Noted: Worked on a railroad for one year and a half, quit because brother would not work; became a "hobo." Alcoholic. Deafness; can not hear a watch tick on the right side and only within 4 inches on the left side. Homosexual reversion. Determinant, sodomistic episode. Case No. 21847.

Fig. 23.—Dementia precox, hebephrenic form. Prison psychosis. Noted: Maternal grandfather suicide. Maternal uncle insane, father alcoholic and tuberculous, mother tuberculous. Patient did not learn to walk or talk until 6 years of age. Always had "fits." Never could retain employment because he was "slow and crazy." "Hobo." Alcoholic, paranoid, illiterate. Insane prior to enlistment. Attempted suicide. Deserter. Case Nos. 20428 and 21137.

Fig. 24.—Dementia precox in a constitutional inferior of a psychopathic make-up. Noted: Enlisted May 22, 1915, psychotic symptoms on November 1, 1915. Wassermann reaction + + . Cranium small, prognathous, forehead recessive. Case No. 22547.

whether this alleged offense would prevent his release in July of this year, as he had been promised if he conducted himself well. The officer replied that it certainly would. Upon hearing this he could not restrain himself, became quite overwhelmed with anger, and struck the guard for reporting him. His behavior which necessitated his readmission to this hospital took place following this episode. The patient dwells upon the fact that prior to this episode he behaved in an excellent manner under prison régime for about four months, and that during his sojourn here he was practically a model patient. This latter statement is true.

During his last admission he certainly did not manifest any signs of mental disorder, and still insisted that he malingered all of the symptoms which led to his former two admissions because he feared severe punishment at the hands of the naval authorities unless he were considered insane.

Anamnesis: The patient comes from a family of farmers in mediocre circumstances. Grandparents are in Bohemia and he knows nothing concerning them. Father died of Bright's disease; was alcoholic; otherwise family history is negative.

Patient was uncertain about the time and place of birth, believed he was about 30 years of age. He entered school at 7 or 8 years, but proved to be a confirmed truant, and his father finally had to take him out of school entirely. He was in the habit of running away from home and school to wander about the country, where he would stop at different farmhouses, claiming that he was an orphan and without a home, until his father would discover his whereabouts and bring him back home. After giving up school he worked as a farm hand earning the ordinary wages paid for this labor. He changed places frequently, was a spendthrift, and assisted his parents only very slightly financially. He led this mode of existence until 1904 when he forged his father's name to a $25 check for which he received a five-year term of imprisonment, part of which he spent in the Minnesota State reformatory and part at the State penitentiary. In the fall of 1907 he was paroled, but broke his parole by enlisting in the Army under the name of Kimlicka, at Fort Snelling, Minn. About a month later this fraud was discovered through his father. He was given a dishonorable discharge, and sent back to the penitentiary, where he remained about six months. At the end of this time (December, 1907) he was granted another parole and went to work for a man named George Hall on a farm in Minnesota. He was there nearly two months when he cut his foot while chopping wood. He said that after this accident he was not able to do much work and his employer did not seem to like to have him hanging around, so he went back to prison, which he said paroled patients were supposed to do when they lost their jobs. As his time was up

in two months the prison authorities made no effort to get him a new job, but kept him there until his sentence expired. He left the penitentiary in March, 1908, and went home for a couple of weeks. He then went to Minneapolis and enlisted in the Navy under the name James Hall, but did not tell the recruiting officer about his prison and Army experiences. About four months after enlistment, while at Newport, he was found in civilian clothes, and for this offense received a dishonorable discharge (?). He then went to Providence, R. I., and enlisted in the Army under the name of Herman Hanson. At Fort Andrews, Boston Harbor, patient was caught out again in civilian clothes and got into a brawl with a sergeant. Patient stated that the sergeant was drunk and provoked the quarrel. As a result the patient was put in the guardhouse and received a sentence of six months and a dishonorable discharge. He served most of this sentence at Governors Island. After being discharged he hung around New York City for a week and then went to Rochester, N. Y. This was in May, 1909. Here he worked for a Mrs. McCale on a farm, and the following month, June, 1909, he enlisted in the Marine Corps under the name of Vilt. He was sent to the Brooklyn Navy Yard, but got into trouble on account of not having his rifle cleaned. He feared that he would be reported for this, and his previous frauds might be discovered, so he deserted. He returned to Rochester, and went to work on a farm. Soon after, he enlisted in the Army, this time under the name of James Hall, but was rejected on account of some nasal defect. This was at Columbus Barracks. After being rejected by the Army he attempted to enlist in the Navy, and was sent to Norfolk, Va. He was here likewise rejected on account of the same defect, and while awaiting his discharge papers it was discovered that he had fraudulently enlisted. He was court-martialed and given a year's sentence. This was on November 20, 1909.

The patient continued to behave very well and did not display any evidences of a psychosis. On a number of occasions he requested that he be allowed to return to prison in order to serve out his sentence, stating that "he had had enough" and that he felt that he could get along all right. Accordingly, it was recommended to the Navy Department that he be returned to prison, and he was discharged on August 12, 1915, and returned to the naval prison at Norfolk, Va.

A letter was received on December 23, 1915, from the commanding officer of the marine barracks there which stated that the patient's conduct while confined at the prison was "in every respect satisfactory and all that could be desired, being in all respects normal, and that he had been discharged by authority of the Secretary of the Navy on December 18, 1915, which was prior to the expiration of

s sentence, the unexpired portion having been remitted on recom-
endation of this office for extraordinary clemency." On January 9, 16, a letter was received from Capt. B. S. Hutcheson, medical offi- Ninety-seventh Battalion, C. E. F., Toronto, Canada, requesting 'ormation about a man, James Hill, who six weeks previously had listed at Windsor, Ontario. He had appeared on sick parade every rning complaining of vague symptoms, but presented no objective ns. When accused of malingering he had related his history, ich led to the above-mentioned letter. The inquirer was furnished abstract of the history of this patient, who, to enlist, had only inged an "a" to "i" in his surname. In reply, we were informed it there was no doubt he was the same man, that he had deserted days before, and there had been no trace of him.

t is readily seen how this individual, as a result of his inherent dequacy, seems bound to gravitate to the military service, because believes it offers him haven. He is readily enlisted because he ears physically fit.

le no doubt selected the Canadian service because he had been efully impressed with the possibilities should he endeavor to enlist in in one of our own services. However, with him adrift again we t not feel immune.

. J.—Ordinary seaman. No. 21565. White male. Age 26 years admission August 26, 1914.

amily history, as obtained from the patient, is negative. Per-
al history: Patient was born in Galicia, Austria, February 15, 8, and is now 25 years of age. His education was meager. About age of 12 he was arrested for peddling without a license and ed a month in jail. A year after this he was brought to the ted States by his family. He worked in a tailor shop for a year. n that time he engaged in various occupations until he enlisted ne Army February 15, 1904, saying he did this because he was of work. He deserted from the Army because he did not get g well and went to London, England, working his passage. le there he was arrested for burglary, for which he served a sen-. Upon discharge he enlisted in the British Army, remaining years, spending most of the time in South Africa. He then ted and returned to England, where he worked for a while. He returned to the United States, where he joined his family in York. While there he was taken by them to Bellevue Hospital xamination and was sent to the Central Islip Hospital for the ne, where he remained four months. He was discharged and ed to return to his home. He then engaged in various odd jobs, being able to hold any position very long because of incompe-. In the meantime his family moved to Springfield, Mass., from

which place he was sent to the Tewksbury State Hospital, where he remained six months, when he eloped and hoboed his way to Cleveland, Ohio, and tried to enlist in the Marine Corps, but was unsuccessful. He then enlisted in the Navy November 15, 1913. He was sent to the west coast, where he remained six weeks, when he deserted and went into Canada. There he tried to give himself up as a deserter, but the military authorities would have nothing to do with him, so he returned to St. Paul, where he gave himself up as a deserter from the Navy. He was sent to the Brooklyn Navy Yard, where he was court-martialed and sent to Portsmouth Naval Prison for two years.

Medical certificate states: "The father is suspected of being feeble-minded. Patient has manifested evidence of being feeble-minded. Has delusions of grandeur following a period of depression. He is apathetic, slovenly, and careless. On August 9 began to laugh, sing, and dance and believed himself to be a prince. Developed hallucinations of sight and hearing. No suicidal or homicidal tendencies."

Mental examination showed the patient to be accurately oriented. Emotional status somewhat apathetic. Insight poor. Sleeps well; does not dream. No hallucinations or delusions could be elicited. Speech was rather jerky in charcter. He pronounces the test words and phrases fairly well. His effort to repeat the cowboy story was poor. Special memory fair. Masselon and Ziehen tests were poorly done. Calculations were correctly performed. He could not do the 50-cent problem. Forward and backward associations were fairly well done. His fund of general information was very limited and he took little interest in current events. The performance of the Finchk test was only fair. His ethical reactions were abnormal.

Physical examination showed a spinal scoliosis. Face was somewhat drawn toward the left in a frequent grimace. Superficial reflexes were exaggerated. Otherwise the examination was negative.

The medical record stated that he was admitted to the naval hospital at Portsmouth, N. H., on June 26, 1914, because of mental symptoms, and he was subsequently transferred to this hospital on August 25, 1914.

After admission the patient showed no evidences of a psychosis. He was clearly oriented, fairly coherent, but his statements were contradictory and unreliable. He answered questions in a dull and apathetic manner, was highly suggestible, and readily attributed dates to certain events suggested by the examiner. He said that for some time past he had heard voices which accused him of deserting from the Army, and a lot of other things. However, definite hallucinations could not be established. He did not sleep well. Frequently during his examination he burst out into silly, childish, laughter,

without any apparent provocation. The patient was placed to work in the laundry, where he did quite well. He then asked for limited-parole privileges, assuring the conference upon his honor that he would not elope. Although it was believed that he would elope, it was decided to try him, as he had not shown any harmful tendencies. Two days after this he failed to report at his ward, and nothing has been heard from him since. He was dropped from the rolls with a diagnosis of constitutional psychopath, unimproved.

PSYCHONEUROSES.

These have been variously termed the minor psychoses or psychoneuroses. This, after all, is an arbitrary exclusion, for the importance of these conditions is relative. They often bear a close relation to each other and are often coexistent, forming a syndrome of much interest, and a group of disorders responsible for most of the cases in officers that come to our attention in a mental way. They are chargeable with considerable inefficiency, and also cause discomfort to those who have to live with them. No greater mistake can be made than to regard these evanescent disorders as of little moment, for there is always an underlying psychopathic organization, and no prolonged manifestation of any of the psychoneuroses occurs unless there is some constitutional susceptibility.

"Neurasthenia," which has been termed a disease of "fatigability and irritability" (Meyer), is not regarded as it once was, and can not be separated from obsessional states, hysteria, and the anxiety neuroses. Hysteria usually consists of a combination of somatic and mental symptoms. It is a subtle arrangement, consisting of two striking essentials—a perversion of the will and emotional instability—with dissociation between the emotional tone and the ideational content. There is always impairment of memory and more or less confusion. The normal mental operations appear to be thrust temporarily into the background, with a predominance of the automatic over the voluntary and conscious psychic operations. The resultant emotion often creates fear and anxiety.

Physically these subjects show constriction of the visual fields, irregularly distributed areas of anesthesia and analgesia, globus, motor disorders of various kinds, at times even convulsions.

The obsessional psychosis is really an exaggeration of the doubts possessed by many normal people. Here besetting and coercive ideas arise which pass the borderline of introspection and obtrude themselves upon the environment. These patients may express fear of dirt or contamination, fear of open or closed spaces, and numerous other phobias. All these forms of mental disorder do not come properly under the head of insanity, because the subject knows the

nature of his obsessions and their absurdity, yet is unable to escape their influence. These besetting ideas enter the foreground of consciousness against and despite the subject's will, with consequent derangement of the train of ideas, and lastly the subjective consciousness of the abnormality. The anxiety that results from the obsession may be accompanied by hallucinations and delusions when the condition approaches a true psychosis. They are practically the expression of degeneracy, and they have a common origin in heredity and predisposing influences. The same weakness of make-up that conduces to dementia precox may simply find expression in hysterical and obsessional states. This class of individuals is productive of considerable damage in the service, particularly as officers. It is here that we must consider what has been termed temperamental fitness, and this question can only be determined under the concrete conditions of actual experience. It is found that these individuals come into conflict with the conditions about them and to which they must adapt themselves if they are to proceed with anything like efficiency, and they fail to make this adaptation. They appear to be placed in a situation that is too complex for their limited mental equipment, and therefore they can not produce the results that are expected of them. There is an inability to "square up with the events of everyday life." This depends largely upon faulty and erroneous viewpoints, upon vicious habits of thought, and narrow and inadequate ideas, false notions and ambitions—in short, upon a biased attitude toward the "world of things and events." There is a tendency to criticize those about them; this thing and that thing are wrong. Their superiors should have done thus and so. They make the greatest amount of trouble for themselves and positively insist upon being unhappy and discontented. Rather than to adjust themselves peaceably to conditions which they can not change, they spend their energy in useless conflict.

This make-up is dependent upon defective education—that is, the experience preparatory to adult life. This is acquired in the home and school, and it is there that the corrections must be made, and their lack must be compensated for by what are really reeducative measures.

These individuals can only be eliminated by careful attention to their life history, and if it is found that they have always manifested an abnormal character of reaction, which has persisted in the service, it may be concluded that it is "constitutional," as King (16) states "an abnormality of make-up." They should be passed upon by boards of medical survey and discharged for disability not in the line of duty.

EPILEPTICS.

Epilepsy is chargeable with a considerable number of admissions, d also damage, as is shown by the following figures:

	1910	1911	1912	1913	1914
nissions	79	106	87	101	88
alided	64	59	64	62	58
nber of sick days	1,841	2,367	2,609	2,710	3,574

In all armies it is a prolific source of admissions and disabilities, mbering as high as 28 per cent of mental cases during war, so it seen that these individuals are especially undesirable during times stress.

n the United States Army during the period from 1903 to 1910 y ranged from 1.23 per thousand (83 cases) to 2.43 (159 cases), raging 1.97 per thousand, or 120 cases yearly. This disease may very vague in its manifestations. One observer (17) found no than 7½ per cent in a series of repeated offenders, and considers t the number is probably greater. The epileptic is dangerous. motives are unsuspected, and he may suddenly become irrational. udden whim or impulse may lead him to commit any deed. The es of consciousness of an epileptic vary from complete conscious- to coma, and the question of responsibility is always dubious.

pileptics are, as a rule, conceited and arrogant. They prefer lence to occupation. They possess a tendency to lie. True itude is absent, and general instability and weakness are pre- inant characteristics. They are erratic in judgment, lack self- rol, are excessively emotional, and at times given to religiosity. y are fond of notoriety, and use various methods to secure it. violent acts of an epileptic are frequently performed during the matic states preceding or following a convulsive attack. These to be committed in a perfectly conscious and coherent manner, n reality this is not so, as when the subject regains his normality is no recollection of any event that occurred during the period e convulsion, after which he is confused, dazed, and weak. All do not show convulsions, and many obscure cases have the epi- c character and mental symptoms. These are quarrelsome, irri- , insubordinate, and tend to violence and impulsive actions.

e epileptic may be eliminated by a careful history, with attention idences of head injury, a scarred tongue, and the evidences of the ptic make-up. To show how an epileptic may get into the service ollowing case is cited briefly:

W. W.—Apprentice seaman. Case No. 21605. (See fig. 5.) e male. Age 18 years on admission September 18, 1914.

Family history: One uncle had tuberculosis. History otherwise negative. Personal history: Patient states he was born in Knoxville, Tenn., November 15, 1896. Birth and development were normal. He began to go to school at 6, continued irregularly for three years and reached the fourth grade. Claims he got along all right and that he was sociable. Says he stopped school at 10 years of age, running away from home because he had gotten tired of going to school. He hoboed his way to Birmingham, Ala. Says he did this because he had heard the town talked about, and wanted to see it. He remained there two or three days, during which time he lived by begging, then went to Decatur, Ala., where he got work driving a team. He led an itinerant sort of existence in various parts of Alabama and Tennessee, living by begging and working at odd jobs. He finally returned to his home town, but said that he did not go to his family, as he desired to avoid them because he didn't want to go home. Finally he did go to see his mother, and worked for awhile on his father's farm, when he decided to join the Navy, because he "wanted to see the world." His father approved of this, saying that if he did this he would know where he was. He enlisted March 2[illegible], 1914, and was sent to Atlanta to be sworn in. While awaiting this he hired a horse from a livery stable and went riding. The horse ran away, throwing him off. He claims to have been unconscious for about 20 minutes, but can give no exact idea as to the length of time. He says his head was not cut or bruised. He came to and had a headache for about 10 hours afterward, which gradually got better. However, he says that he was able to get up and find the horse which had wandered about a mile and a half up the road. A week after this injury he had a convulsion, felt sick and dizzy, and then became unconscious, but did not bite his tongue. After the convulsion he fell asleep for two hours. Following this he could not sleep and walked the floor in the dormitories. He was ordered to go to bed but refused to do so. Was finally placed in bed by force. He did not inform the medical officer or the naval authorities of this action nor of the convulsion, as he stated he knew this would prevent him from being admitted to the service, as a man had been rejected for this reason a few days before. He was sent to Norfolk, Va., to the training station, and while there he had another convulsion. He was sent to the hospital where he had about one convulsion a week for four weeks, when he was sent here.

Medical certificate states: "The first symptoms became manifest August 20, 1914. Acted queerly, had delusions and was depressed. Present symptoms: Delusions of persecution. Maniacal at times, very irritable, and refuses to eat or talk for days at a time. Probable cause—heredity and change of environment."

ental examination: Patient is well oriented. Emotionally is er apathetic, has good insight, sleeps well, claims he does not n often, but when he does his dreams are unpleasant. Last n was that he ran away from camp and they were catching No hallucinations or delusions could be elicited. Speech is al. Repeated the cowboy story fairly well. Special memory were well done. Masselon test was well given. Ziehen test well understood. Calculations were poorly done, his answers only approximate. Forward and backward associations were t all correctly given. General information was poor, knowl- of current events was limited. Finchk test was poorly done. al reactions were normal. During the examination patient was ive, but sluggish. He answered questions willingly but slowly. esitancy seemed to be due to ignorance.

sical examination: Patient was somewhat pigeon-breasted. l arch high and narrow. Examination otherwise negative.

ical record states: Admitted to the sick list August 20, 1914. d been acting queerly for several days; refused to eat; saw nary things. He was depressed at times, excited at others. s extremely dull and stupid, would not talk, and it was im- e to get any history from him as he would not answer ques- He continually repeated the word "sick." Examination to reveal any physical condition. August 26 patient still l to talk; but ate and slept well. At night he would be found on the edge of his bed, and he asked for a rocking chair, he could sleep better in it than in the bed. This was the only he said since admission. On August 30 he showed some delu- September 2, became maniacal, threatened everyone who came im, broke up his mess gear. Used profane language. Sep- 17 was transferred to this hospital.

ently here we have a psychosis associated with epilepsy, and estion of line of duty is not at all clear. He probably was eptic and had been for some time prior to enlistment, and ained the traumatism as a result of a convulsion rather than lepsy as a result of the traumatism. He is rather stupid and ntly a rather inferior type of individual.

patient continued to have convulsive attacks at about weekly s, but these were not severe and he rapidly recovered from owing confusion. He was discharged from the hospital into of his father on April 3, 1915.

SYPHILITICS.

er (18) has stated that a large part of the syphilis of the s contracted prior to enlistment. It was found that 16.77 per

cent of recruits gave positive Wassermann reactions. These did not display any clinical evidences of syphilis, and were unrecognizable at the usual physical examination. It is considered that about 20 per cent of the applicants for enlistment are syphilitic. It has been estimated that 5.46 per cent of the cadets at West Point are probably syphilitic, and that 30 per cent of the white males in the Government hospital (19) have syphilis, and that at least 10 per cent of the insanity here is directly due to syphilis. Of the Navy insane 7.69 per cent are known as syphilitic and 10.44 probably syphilitic, making a total of 18.13 per cent. In the Navy 13.63 per cent of the cases of "insanity" are directly due to syphilis.

Leaving out of account the multiplicity of other disorders that it may lead to, it is important to detect syphilitics who apply for enlistment in order to exclude a likely source of mental disease. It is even more important to reject syphilitics who are candidates for a commission, as the manifestations of syphilis that indicate aneurism, locomotor ataxia, and paresis are late in development, so that there is a tendency to retire these cases as in line of duty. One can never predict when mental symptoms will occur in a syphilitic, and under the stress of war conditions he is likely to break down; so we have the possibility, in time of war, of a battleship being commanded by a paretic. Steir (20) says those who have had lues, especially of long standing, are particularly prone to mental disease in time of war, and White (21) has said no man who has a positive Wassermann should command a ship. Recently three officers continued in positions of importance after they were manifesting undoubted mental symptoms.

At present there are still remaining in the service at this hospital 3 officers and 15 enlisted men, and of these the 3 officers and 8 of the men are here because of syphilis, with one more of the latter having syphilis, but this is not the direct cause of his mental disorder. So it is readily seen how important a factor we have to contend with in this disease.

It would be desirable to have a Wassermann made on all recruits after they reach the training station, during the recommended probationary period, on all midshipmen at the Naval Academy as a part of their examination for a commission, and as a safety measure upon all officers as a part of their examinations, both upon entrance from civil life and for promotion.

To show how soon a syphilitic may come to our attention in a mental way the following case is abstracted:

B. F.—Coal passer. Case No. 22401. (See fig. 6.) White male. Age 25 years on admission October 30, 1915.

Family history obtained from patient: Mother is easily affected by heat. One uncle committed suicide. Otherwise negative.

Personal history: Patient was born January 17, 1890, in Newark, J. Went to school at 8 years of age, and attended for seven years; tes he always just passed. He did not care much for school. He s in the fifth grade when he finished; failed of promotion in his t class. At the age of 15 he went to work as carpenter's appren-, receiving $7 a week. After eight months he received a raise of a week. He did not tell his father of this, but kept it for spend- money. When his father found it out he threatened the patient, then ran away from home. Says he went to West Point, where ried to be a cadet, but ended by taking a job as waiter in the mess , receiving at first $18 and later $23 a month. He remained there a few months. He then hoboed his way to Indianapolis, where got a job at $3 a week. He did not keep this long, but went to k on a lake steamer plying between Buffalo and Detroit. He drifted to Wyoming, working for several years on ranches at es varying from $30 to $45 and his keep. Says he never worked three or four months on any one job. Last fall he went to the vest fields of North Dakota, and after being there 10 or 12 days t to Minneapolis, where he worked in a restaurant for a month, owing which he enlisted in the Navy. He was sent to the Great es Training Station, where he remained for six months; then sent to the U. S. S. *Michigan*, where he remained for three ths, when he had an argument in the fireroom, and because of was sent to the Philadelphia Naval Hospital, subsequently com- here.

resent illness: Says he got into an argument aboard ship. He not want to leave the fireroom, saying he got "crummy, foolish, y, and funny," and lots of the fellows were jeering at him. Says t down and would not do anything. They called him "soup." en a man's the cheese he don't like to be called the cheese. They d me Bessie. A man named S—— aboard ship acted foolish. sked me to come over and lay down by him. This man S—— d me Bessie." By calling him these names he thinks the men intimating that he was guilty of various perverted sexual acts. tient was admitted to the hospital on October 30, 1915, and lied readily with the routine procedure. Says he had been ned in the brig because he had trouble with a man named S——, called him bad names. He did not pay any attention to this who got mad at him and took his revenge by calling him ie, "to make a woman out of him." He says that on shipboard person does not like another he tries to make a woman out of that is, a sexual pervert. The patient never liked this man –. No hallucinations or delusions have been formed by the pa- in his present environment. He states that about a year ago in North Dakota he had a venereal sore. Three or four months

later a fine rash appeared on his abdomen. He states that he took treatment for this condition. He does not believe he is crazy, but states that he has not a very keen mind. He says he is no different than he has always been. Says he would like to be discharged from the Navy, and in almost the same voice states that he wants to finish out his enlistment so that he can go home, because he does not want his people to think that he can not work out his full time. Says he is sad and depressed because of the fear that he will lose the regard of his relatives on account of his illness and his being discharged from the service. He does not believe there is anything wrong with his mind, and says he does not see how the Navy can figure out in 19 months what he has been unable to determine in 26 years. He is correctly oriented in all spheres. He believes that there are several crazy people in the ward where he is, and he does not think it was right for him to be sent here. He states that he merely sat down on the deck, and was quiet and would not think. He says, "I would not think until they stopped believing that I was a pervert." He says that everyone in the fireroom was crazy, because all the firemen on the ship tried to put out the fires with coal, while he just sat around, and they thought he was crazy, and he might have acted quiet in order to be like the rest. He says if he is allowed to leave the hospital he will leave the United States forever. Says he is depressed and believes he will be so all his life. He says that one of the nurses in the Philadelphia hospital was put up to make love to him. He is very accessible and is inclined to be emotional when questioned regarding his present difficulties. Says "I haven't got any troubles, only I am crazy, and I want to get out of here." Hallucinations and delusions are denied, but he says he has been asked so many times if he hears voices that he thought he may have, but now he knows he has not. Insight and judgment: Says there is nothing wrong with his mind; in fact, he has not a doubt of it. Thinks he might be crazy before he leaves. He says the Navy got him here for three years; that he will leave, money or no money, and will get a way to escape. Habits and character: This patient for the past 10 years has been a wanderer, never remaining in one position very long. Admits using alcohol, but says that it makes him sick. While at the training station he was not apt, was insubordinate and created disturbances, and was confined in the brig. There is no doubt that he has been frequently guilty of perverted sexual practices. He is well oriented, his memory for remote events is good, and is especially good for recent events. Special memory tests were well done. His fund of general information is quite complete. Was able to perform the intelligence tests, and understood the Ziehen test, and also the Finchk test. He gave the forward and backward asso-

tions correctly, and performed the required calculations: His ical reactions were indecisive.

Physical examination was negative except the evidences of a scar on the penis, the presence of a facial asymmetry, and a slight ech defect. Wassermann reaction with the blood serum was double s.

Here we have an individual who is unquestionably of a psychonic make-up, and in whom syphilis was the determinant of the chosis.

ALCOHOLICS.

lcohol has ceased to be as important as formerly in the direct ation of mental diseases, and it is not often now that it is the factor in the production of a psychosis. In going over the his- of cases (22) it is ascertained that the drink habit leading to holic "insanity" is always formed early in life. The average tion of the habit prior to admission to a hospital for the insane years. The liquor principally causing "insanity" is whisky. er regular or periodic drinking may lead to a psychosis. A fixed of excessive drinking, with frequent intoxication, precedes mental breakdown. The deteriorating effect of the alcoholic is reflected in the occupational inefficiency. The physical health paired in about 40 per cent of patients. The use of drugs is a gible factor in the production of alcoholic psychoses.

normal mental conditions cause excessive use of alcohol in some especially in epileptics, psychopaths, and dementia precox in- uals. Alcohol leaves its mark upon its victim, and it is usually to exclude the chronic alcoholic. In alcohol we have an excellent ion of the mental resistance and stability of the individual, nothing better shows up the unresistive types. It would seem ble to utilize this determinant for eliminating in times of the inadequate individuals who will break down in time of This can be accomplished by allowing alcohol to show up who can not handle it, and, therefore, themselves, thus reveal- eir inadequacies, instead of deluding ourselves that we have ble the services of those who will prove dependable.

e may be quoted the history of a rather typical alcoholic:

J. W.—Coal passer. Case No. 21574. (See fig. 7.) White Age 28 years on admission August 29, 1914.

ily history: Father was a morphin habitué and addicted to l. Was regarded as eccentric. One sister is considered queer, ad considerable marital trouble and is exceedingly jealous, according to the patient, is without basis. One maternal cousin an inmate of the New York State Hospital (for the insane) ffalo, N. Y.

Personal history: Born in Buffalo, N. Y., October 25, 1885. Education up to one year of high school. States he got along well and was sociable. Left school to go to work for the Lackawanna Steel Co., where he averaged $110 per month, and remained there for three years, giving as an excuse for leaving that his health was poor and also that the steel plant was a great way from his home. He was out of work for about two months, when he went on the road for a grocery house, receiving $18 a week. Remained there for three years, and left to go on the road for a soap dealer, because he thought the opportunity was better. Here received $75 a month and his expenses. He worked there about two and one-half years, and left because he had been drinking considerably and had gotten careless in his work, but says he was not discharged. Claims he had a difficulty, which arose over the fact that he had made an error of 50 cents in the sale of some goods, and this was deducted from his salary, which made him angry and he quit. He was out of work for about four months; then secured employment with a packing company as soap salesman, receiving $18 a week, and held this for seven months, then left because he was drinking. He was idle for almost a year, and then was told he would have to get out of his family's house. He decided to enlist in the Navy, which he did at Buffalo, N. Y., on July 21, 1914. He did this on the advice of his brother, who was already in the service, thinking by so doing he could avoid drinking. He had used whisky to excess for 10 years. He believes he has had syphilis, and was treated for this for two years; but there seems to be some doubt about this. His Wassermann of the blood serum was now negative. Ten years ago he sustained an injury to his head by falling off a lumber pile and was unconscious for 20 hours.

Medical certificate states that he had been an inmate of Providence Retreat, Buffalo, N. Y., where he had taken a cure for alcoholism. He is verbose, somewhat delusionary, and has had hallucinations. Made two attempts at suicide. Probable cause, heredity and alcohol.

Mental examination was negative. The special tests were all well performed.

His medical record stated that he was admitted to the sick list on July 26, 1914. Had been drinking considerably, and could not sleep. About 8.30 p. m. he was found running about the deck, and insisted that enemies were after him to cut his throat, and that he heard voices, and had committed a wrong for which he would have to forfeit his life. He was transferred to the Naval Hospital, New York, where he continued to have about the same symptoms, which resulted in his transfer to this hospital.

After admission the patient behaved quietly and orderly, and did not occasion any trouble. He assisted with the ward work willingly and quite efficiently, and did not violate any of his privileges, with

exception that on January 30 he was found under the influence cohol, which he acknowledged having obtained from the medi- closet in one of the wards. As result of this he became excited, d, and ättempted to assault the attendants and physicians. r this time he apparently returned to his normal condition, and is discharged from the hospital on April 23, 1915. A short time this he was returned to the hospital by his mother, who stated ie had been drinking, and desired to return to the hospital. He etained here for about a month and again discharged.

e is a patient who admits having used alcohol to excess for l years, often as much as 30 or 35 glasses of whisky a day. He a history of having been in two hospitals for mental disease, f having taken special treatment for alcoholism; also gives a ble history of syphilis. He makes the general impression of a c alcoholic.

DRUG ADDICTS.

gs in themselves are not frequent causes of insanity in the , but, aside from that, are productive of considerable trouble. lieved that many men form the habit after enlistment, through tion with those already addicted, either among their ship- or with women of the underworld, who are notoriously prone e habits. In one or two centers this might almost be termed c. In Philadelphia cocain addiction is especially prevalent, n Boston, and Portsmouth, N. H., the heroin habit is noted as it. Morphinism is not as common. With this latter we have of attention, particularly in the realm of sense observations. nical sense is dulled. The habitué is unable to discriminate . He is impulsive, while his will power is lost, and his con- r his impulses therefore lessened. He is subtle and conceal- l is likely to be dominated by unforeseen impulses. His re- lity is impaired, and he is constantly doing and saying things ort of which he does not comprehend. The tendency to almost pathognomonic.

nism has apparently been widespread in the service. It is ly taken by snuffing. It causes fairly definite symptoms, ess, insomnia, and anorexia. There is a tendency to elation, sullenness; there may be hallucinations and mild delusions. ly there is tremor, exaggerated reflexes, incoordination, ic twitchings, and even convulsions. Owens (23) has called to the characteristic ulceration of the mucous membrane asal fossæ as an aid to detecting suspected cases. Heroin[1] iffed also causes inflammation of the nose.

n is called to an abstract of an article on heroin habitués in the U. S. Naval lletin, January, 1916, p. 129.

In conclusion it may be stated that—

1. Dementia precox is by far the most important mental disease with which we have to contend.

2. Feeble-mindedness in itself is not a serious factor.

3. Drug addictions rarely cause mental disease in the service.

4. Alcohol has ceased to be important as a direct cause of mental diseases in the service, but it is frequently a contributing factor in their production, especially when associated with syphilis.

5. Syphilis causes considerable damage. It is the cause of most of the mental disease in officers and men of long service. Measures should be taken to prevent the risk of having a syphilitic in a position of responsibility, especially during the stress of war. It is urged that more effort be made to acquaint the officers of the Navy, also the midshipmen, with the widespread damage of this disease, extending as it does for years after the initial lesion, and often culminating in hopeless dementia.

6. As the examination at enlistment does not permit the exclusion of all unfit, it is considered that a probationary period, say, of three months at a training station should be required before the completion of the recruit's enlistment. This would give opportunity for examinations to be made, and above all, to observe the individual's reactions to his environment.

7. The history of the candidate's life—that is, a cross section of his career—gives the best information on which to exclude the undesirable. It would be well, while the need of men is not pressing, to require candidates to provide credentials giving information of this kind. Many patients here are found to have been inmates of insane hospitals prior to enlistment, and this fact is frequently easily ascertainable.

REFERENCES.

1. Bleuler. Schizophrenia. Ashaffenburg's Handbuch der Psychiatrie.

2. Meyer, Adolf. Dementia Precox: A Monograph. Meyer, Hoch and Jelliffe, 1911.

3. Southard, E. E. A Study of the Dementia Precox Group in the Light of Certain Cases showing Anomalies or Scleroses in particular Brain Regions. American Journal of Insanity, May, 1910.

4. Southard, E. E. Cortex Lesions in Dementia Precox. Contributions Massachusetts State Board of Insanity, 1914.

5. Holmes. The Relation between Dementia Precox and certain Amines. Journal Clinical Medicine, June, 1915.

6. Ludlum and White. The Thymus and Pituitary in Dementia Precox. American Journal of Insanity, April, 1915.

7. Meyer, Adolf. Fundamental Conceptions of Dementia Precox. British Medical Journal, September 29, 1906.

8. Hoch, August. Constitutional Factors in the Dementia Precox Group. Review of Neurology and Psychiatry, August, 1910.

9. *Wolfsohn.* Die Hereditat der Dementia Precox. Allg. Zeitschr. f. Psych., 907.

10. Butts. Insanity in the Navy. U. S. Naval Medical Bulletin, 1910, p. 459.

11. Hickson. The Relation of Pfropfhebephrenia and Dementia Precox to rime. Illinois Medical Journal, 1915.

12. *Sheehan.* Service Use of Intelligence Tests. U. S. Naval Medical Bulle- n, April, 1915.

13. *Bowers.* Constitutional Immorality. International Clinics. Vol. 4, series , 1913.

14. Healy and Tenney. Pathological Lying, Accusation, and Swindling. iminal Science Monograph No. 1, 1915.

15. Nitsche and Wilmanns. Prison Psychoses. Nervous and Mental Disease nograph No. 13.

16. King. Mental Disease and Defect in United States Troops. Bulletin No. War Department, March, 1914.

7. Healy, William. Modern Treatment of Nervous and Mental Diseases. ite and Jelliffe. Vol. 1.

8. Vedder. Prevalence of Syphilis in the Army. Bulletin No. 8. War De- tment.

9. *Hough.* Prevalence of Syphilis among the Inmates of Government Hos- l for the Insane. Jour. Am. Med. Assn., p. 972, 1914.

. *Steir.* Militarärztliche Zeitschrift. 1908 u 1907.

. White. The Application of Psychiatry to certain Military Problems. ure U. S. Naval War College, 1913.

. Pollock. The Use and Effect of Alcohol in Relation to the Alcoholic hoses. State Hospital Bulletin, August, 1915.

. Owens. Signs and Symptoms presented by those addicted to Cocain. . Am. Med. Assn., February 3, 1912.

GREATER FIELD OF ACTIVITY FOR MEDICAL OFFICERS OF NAVY YARDS.

J. Blackwood, Medical Inspector, and W. H. Bell, Surgeon, United States Navy.

Those who have watched the development of naval conditions re and are cognizant of the advances in preventive medicine, who are appreciative of the meaning of both, can not be oblivi- o the importance of careful sanitary supervision of yards and ons. By General Order No. 16, March 1, 1906, 1168b, medical rs are made responsible for a watchfulness over those matters n may directly or indirectly be prejudicial to health, and they xpected to keep the commanding officer informed and to guide n the rectification of existing conditions. In this respect the nly reports have a definite value as a means of fostering sani- watchfulness, of keeping the commandant and the bureau in with matters bearing upon health, and of continually em- zing the necessary improvements, but it was not the bureau's ion in recommending, or the department's intention in pro- ating, the regulation that it should relieve medical officers of

the logical procedure of bringing pressing matters to the attention of the immediate authorities whenever and as often as they might arise or come to notice. As a matter of fact, there should be no delay in seeking to correct a sanitary defect. These matters should not be allowed to accumulate on memoranda and be brought to the notice of commandants for the first time in the monthly reports. These reports ought not to be the month's accumulation of observations, but rather a review of the sanitary work for the month, with a reiteration of those urgent matters which have been the subject of recommendation but which have not been acted upon, and additional recommendations concerning any new matters that may have just come to light. The bureau desires to be understood as wishing to contribute the very best that it may toward the successful administration of every naval command, and, in return, it only asks the coöperation of the yards and stations in carrying out the dictates of preventive medicine.

"Success in these aims depends to a great extent upon an understanding and assistance from such sources, and in order to enlist the support of commanding officers, observed sanitary defects within the realm of their jurisdiction must be brought to their attention not in the form of a criticism at the end of each month, but as information to be conveyed from day to day, or as opportunity occurs, and conveyed in such a manner as to evince a spirit of good faith and honest purpose. This is the type of official intercourse which fosters a cordial relation and begets mutual confidence. It is a method of procedure which offers greatest promise of attention to important matters and insures the correction of existing defects within the means at the command of this particular authority and according to the ideas of his sanitary adviser."

The above quotation from the Annual Report of the Surgeon General, United States Navy, for the fiscal year 1909, in general expresses our view of the proper principles underlying the relation between the commandant of a navy yard and station and his medical officer. It was written as an exhibit of the bureau's general policy in the hope of guiding medical officers concerned to an effective performance of their duties, and for the purpose of acquainting present and future commandants with the desires and aims of the medical department. It has been interesting to observe the practical application of what, at the time of writing, was merely a theoretical conception. Briefly, the conception contemplates a broadened field of usefulness for the medical officers of yards; and the manner of its observance and development, first at the Norfolk Navy Yard, and now at the Philadelphia and Boston Navy Yards under commandants of quite different temperaments and ideas, has been attended with

such uniform success in point of both harmony of action and service results that there is undoubted justification for presenting the details.

Before discussing the various elements entering into the scheme of navy-yard service, however, it is timely and proper to make a few general observations.

Nothing that has been or is being done is in default of compliance with the Navy Regulations and Instructions and Manual for the Medical Department, or in substitution for any provision thereof. These books represent a codification, we take it, of the most salient requirements in the interest of uniform action, administrative harmony, and service efficiency, but, large and comprehensive as these books apparently are, they do not and should not attempt to, and could not successfully define the duties of a particular office in more detail than is necessary to indicate a course and provide a basis for cooperative effort. Much is everywhere properly left to the initiative and resourcefulness of the incumbent of that office—his area of discretion—and it is by utilizing the latitude of this area for useful service to the full, quite as much as through any other means, that the possibilities of the office are rounded out, the interests of the service are advanced, and progress is made. There is no need to enumerate all or cite any one in particular of the several specific or general provisions set down in the books mentioned, for these are always available for reference, but we believe we are right in saying that they are not restrictive in the sense in which we are discussing them, and are broad enough to admit of almost any innovation within the scope of medical department activity, calculated to enhance its usefulness as a coordinate branch of the Navy.

The aim, therefore, will be to show what use has been made of this area to secure a degree of efficiency in the medical department of navy yards which would express something more than just "well enough," in accordance with the provisions of the United States Navy Regulations and Instructions and the Manual for the Medical Department of the United States Navy, and to demonstrate the opportunities in navy-yard duty for usefulness to the service at large.

It must be recognized that success in this direction is dependent upon three primary factors: (1) An effective organization and daily administration of the medical division, even though small; (2) a thorough knowledge of conditions in the yard and those outside (in the city and its environs) which influence local conditions, or which must be taken into account in bringing about desirable changes; and (3) a type of official intercourse with naval and civil authorities which fosters cordial relations and begets mutual confidence.

The first of these is necessary to avoid the haphazard conduct of responsibilities, and as the basis of an ability to meet all possible

demands in the smoothest, most expeditious, and thorough manner, and thus to contribute the department's proper quota to the success of the command.

The second is necessary as the basis for an intelligent supervision of sanitary problems and health conditions and as a prerequisite to the suggestion of sanitary rules or reforms. It would be idle to sit down in one's office and formulate an ideal proposition in any given direction and complacently plume oneself that one's duty had been done. There are various circumstances and considerations which bear upon every contemplated reform to which one's attempted solution must be adjusted without necessarily quashing its feasibility. If a desirable and necessary advance can not be made in what seems the ideal way, some at least temporarily satisfactory alternative can be found to meet the requirements and accomplish the desired ends. It is the medical officer's duty, after first acquainting himself with the difficulties and learning the financial possibilities, if money is involved, to exercise his ingenuity in finding a way to make his recommendations practical. One executed reform is worth a dozen filed away, no matter how perfect in conception and necessary they may be, which are unacted upon because of their Utopian impracticability.

The third factor is necessary in order to avoid friction, that greatest of all blocks to progress, and to either give one a free hand or insure that degree of cooperation which will bring the quickest and fullest results. A spirit of reciprocity must obtain, and an understanding agreement as to purpose must be reached between the naval authorities, or the civil health authorities, as the case may be, and the medical representatives of the navy yard; and it is always possible for a naval industrial plant to do much in the interest of a city's health, just as it is for the city to be of great assistance to a naval community. If a disposition to honest reports and frank dealing exists, almost any situation can be handled and any requirement compassed. In the effort to make the office of the medical officer of the yard all that it may be his intercourse on all sides should be governed by tact, adjusted to the personal susceptibilities of the individual addressed or dealt with, by patience in the face of inevitable difficulties, by ingenuity in circumventing obstacles, by persistence in the effort to secure results, and by unlimited interest and energy in seeking out and executing beneficial reforms, not in a busybody sense for the sake of reform, but for the sake of the benefit where improvement is really indicated.

Where does the medical department of a navy yard stand in relation to all that goes to make a large naval station, and of which it is a part—not in a physical sense, but from the point of view of helpful service?

)n the one hand there are the other departments of the yard, ı of which, in general terms, is separately housed and employs reater or less force of civilians—men who live outside but come the yard every day to work; the families of officers residing ıin the yard and their household employees, for, from the health ıt of view, it is impossible to disregard domestic servants; the ine barracks; and the ships stationed at the yard or visiting it. n the other hand there is the adjacent or surrounding civil nunity and the naval hospital.

e are disposed to think that the medical department of the on stands in a position which is central to all of these and in ıitary and health sense is the integrating factor. At all events is a very real though perhaps hitherto undefined relation be- n all these elements and the yard dispensary which can be ed to good advantage, and an analysis of it will display the rtunities and the idea which should animate medical depart- activities.

st of all there should be a code of sanitary rules, standardizing ontrolling all the routine requirements having to do with clean- and health which are inseparable from every fixed community, ding garbage, refuse, and manure disposal, the care of the , and the cleaning of toilets, etc. If such a code is not in nce it should be prepared, either *in toto* or by gathering to- r scattered existing rules and supplementing them in accord- with the needs of the particular station.

regards the civil force during its working hours, medical de- ıent concerns properly overspread practically every department yard both in daily direct service, such as sanitary and hygenic fulness and interest in the "safety first" idea, and in its direct ssional relief and assistance in the event of personal injury or emergency. In addition to the extent to which civil employees t by the general sanitary accomplishments in the station at they benefit by those measures directed specifically at the build- r immediate locality in which they work and by the rules de- l and vigilance exercised to prevent the spread of contagious ectious diseases, and to insure a wholesome supply of milk her foodstuffs. A large proportion of the civil employees buy s from vendors permitted to do business within the yard.

regards families and their servants and service personnel, they cluded in the considerations which have led to the provisions mentioned, and they benefit directly or indirectly from them. lition the members of the various households on the Govern- eservations and the personnel of the marine barracks and other ands, which immediately concern the medical officer of the

yard, are cared for in illness, and guided in the preservation of health by vaccination and timely advice against seasonal dangers and specific sources of infection. In this connection the more or less intimate contact of servants with the members of the families by whom employed and their frequent comings and goings, or periodic visits in off times to localities often of questionable healthfulness, constitute a real danger to the naval community, and exact consideration in the interest of thorough medical watchfulness to see that a contagion or an infection does not slip in unawares and establish a disease which might seriously complicate official interests. Although an important possible source of trouble, they are in the background, as it were, and easily lost sight of in the problem of preventive medicine. When we are really civilized, the health authorities of cities will give practical expression to their recognition of this fact by affiliating municipal medical examiners with every employment agency. The present omission of such wise provision we attempt tactfully to supply to the extent and in such a manner as the susceptibilities of the individual make possible, no official exactions being possible owing to the great difficulties that already complicate the servant question in a place so remote from the center of things as most navy yards.

But it may be pertinent to remark that already in New York, Boston, and Philadelphia a number of hotels and restaurants will not employ waiters and cooks who can not furnish a certificate from certain designated physicians as to their absolute freedom from communicable diseases. This practice is growing rapidly, so that the applicants voluntarily submit themselves for these examinations and certificates before applying for positions. If such advances are considered necessary for the safeguarding of the general public how much more necessary must it be for us in relation to our domestic servants, who live in so much more intimate contact with our families? How many householders know, or have even taken the trouble to ask, whether their cooks and waitresses are typhoid, dysentery, or epidemic meningitis carriers, or are infected with tuberculosis, syphilis, or gonorrhea? And yet we allow these domestics to handle and prepare our food and play with our children, while we sit supinely and either willingly or ignorantly place our lives or health unreservedly in their hands.

As regards the ships stationed at the yard or visiting it, they also are included in the considerations which have led to the general sanitary conditions and provisions, but they represent quite a different demand, as the personnel of these units is cared for by its own medical officers, who are usually unfamiliar with the general local conditions, and without that special information which is of immediate importance to them in carrying out their duties.

The medical officers of ships want to know the potability of the ter supply; the wholesome sources of supply of milk and other odstuffs and anything which affects the general market; the pre-ling communicable diseases and their localities; the venereal dan-s and other pitfalls, such as the procurability of habit-forming igs frequently associated with tenderloin districts; the availability hospital facilities, and such aids to diagnostic precision as the Was-mann test, the X-ray, and bacteriological culturing, and the local nalities in procuring these; the possibilities of having clothing bedding disinfected, and the manner of going about it; the ar-gements for dental treatments and the form of certification pre-nary to such service; and any other professional assistance the l is ready to give. together with those sections or paragraphs of yard regulations which pertain to official matters or procedures ng within their responsibilities. This data we give them in cir-rs or bulletins issued from time to time as circumstances dictate, supplemented by briefer notices issued to incoming ships as soon ey have moored and communication is possible.

e medical officers of ships also want to know what opportunities ocality may offer for postgraduate study in one branch or an-; to see the professional work (surgical or medical) of its dis-ished specialists; to enjoy the benefit of association with its p of medical men; and frequently direction is sought, either in own interest or that of a patient, to a representative of one or er of the various specialties. All this information and more announce our preparedness to give in detail upon the asking, and e that it is understood that when any information requested is our possession at the moment desired we stand ready to obtain mptly.

propriety of the belief that such duties should be assumed by edical officer of a navy yard is based upon the idea that, as rd dispensary is a permanent office and properly in constant with everything in the locality which is of interest and value ealth, sanitary, and broadly professional sense, it should be nter or clearing house for information which it would take edical officer, undertaking to inform himself, weeks if not s to learn. A medical officer assigned to duty which is less nently identified with a given naval station than is the yard sary, or which brings him within its boundaries only as an t, has a right to look to the medical officer of the yard for formation and to expect to be relieved of the time-consuming ty to duplicate the search that should have been completed efore. Not only should such a medical officer be supplied e most complete data along the lines above indicated, to help

him to advise rightly his commanding officer how to safeguard the health of those under him and to give him a chance for professional refreshment, but these data, when concerning a topic subject to change, should be kept up-to-date and the medical officer kept in touch with local current events or developments through the medium of periodic supplemental circulars or bulletins.

As regards the adjacent civil community, anything that may be done within the boundaries of the Government reservation to perfect sanitary arrangements and safeguard health can not fail to be a most acceptable contribution to the health department of the civil community, because such action makes the Navy a welcome neighbor, in that it guarantees that the field in which its citizens labor is freed of menace to their health. Moreover, any reasonable sanitary observance which may be insisted upon by the Navy authorities is a practical lesson in the process of educating the public, and operates to strengthen the hand of the city health authorities in securing or winning compliance with up-to-date laws and rules in their own territory.

Again, it is well known that, even in the present state of development of the public-health conscience, many cities are lacking in provisions for adequate sanitary control of the production or preparation and the handling of foodstuffs of various kinds, as evidenced by the existence of organizations such as the Consumers' League and civic clubs which undertake to protect the consumer in this as well as other directions. It is given to the Federal Government to lend substantial support to the better element and higher ideals of the neighboring community from which food supplies are drawn, by reason of the fact that at any one place the Government's needs are sufficiently large to make its patronage eminently worth striving for. This is actually the case in practice as well as theory, and the Government representatives have but to say that word which will make at once for its own interests and those of civil communities.

It is in this direction also, therefore, that medical officers of yards and stations may employ themselves to advantage; and the end has been accomplished at Boston and Philadelphia by formulating, either independently or in supplement to existing laws and rules or in advisement with a branch of the Consumers' League, or other similar organizations, a reasonable standard of requirement in accordance with modern sanitary ideas pertaining to the arrangement, equipment, and methods of the establishments of dealers in food-stuffs, with which all prospective bidders must conform to the satisfaction of the medical officer if their propositions are to be considered and accepted. With the hearty, intelligent, and efficient cooperation of the supply officer at the Boston yard and the purchasing pay officer

at Boston every proposal issued in call for bids now bears the following stipulation, and no contract is awarded unless the bidder complies with it:

No award shall be made to any dealer unless the said dealer's establishment appears on the approved sanitary list of the Consumers' League of Massachusetts, subject to the approval of the medical officer of the navy yard, Boston, Mass., or unless the said dealer's place of manufacture, preparation, and packing, and all appurtenances and utilities pertaining thereto shall have passed a sanitary inspection by the medical officer of the navy yard. Furthermore, any and all contracts with any dealer shall be voidable without notice, at the discretion of the Bureau of Supplies and Accounts, if at any time the dealer's establishment is removed from the approved list of the Consumers' League of Massachusetts, or if, in the opinion of the medical officer of the navy yard, the dealer fails to maintain a satisfactory sanitary standard. If a dealer declines to afford proper facilities for inspection or hinders such inspection in any way, his proposal shall not be considered or his contract shall become void, as the case may be.

At the Philadelphia yard also the supply officer and quartermaster of marines are cooperating in the effort to secure the added protection of such sanitary requirements by a stipulation modified from the above form to meet local conditions, but quite similar in purport. This entails the work of inspection, but it brings a valuable knowledge of the industries concerned and promises results that are worth striving for.

As all Government contracts specify the ingredients to be contained in foodstuffs, and as all contract foodstuffs are carefully inspected by an expert before they are accepted, now, with this added assurance that it is prepared and handled in sanitary surroundings and by cleanly methods we can feel fairly well assured that the food for the men of the Navy and those living in naval establishments is all that it should be in quality and hygienic value. But there still remains a loophole for the entrance of contamination, and that is on board ship between the time of receipt and issue for consumption by the messes.

We would therefore like to here interject a caution to the commissary and medical departments of cruising ships, to the effect that all our efforts may be useless unless the greatest care is exercised in the sanitary handling and preparation of these foods after they have been received aboard. Space does not permit of our entering into details of this matter, but every officer on cruising ships, if he energetically pursues the lines of preventive sanitation here led up to, will undoubtedly find many things to reform, and so contribute to the general good.

Supervision must also be had over the various retail dealers in foodstuffs, especially of milk and its derivatives, who seek to do business in navy yards, either with the residents or the visiting ships

or civil employees, and sanitary rules should be laid down, fixing a standard which shall obtain in their establishments in order that they may be eligible to a permit, and controlling such traffic in the yard. It is a reasonable assumption on the part of ships and others that supplies sold within the Government reservation are safe articles of food from the health point of view, and consequently there is a moral as well as a sanitary obligation placed upon the yard authorities to see to it, as far as may be practicable without giving certificate of assurance, that that confidence and dependence is justified.

In addition to these indirect ways of assisting to better municipal conditions while conserving the Government interests, there are services of more immediate consequence to both naval and civil communities which can and should be rendered. We refer to the procedure which may be devised, in obedience to official injunction, to prevent the spread of infectious and contagious diseases, and foster the gratifying possibility of being able each month to report that none of the contagious or important infectious diseases originated within or was brought to the yard. In perfecting a plan to control the danger herein involved, agreement was reached between the cities and yards under discussion by which each of the pair in juxtaposition would notify the other of its knowledge of any case of quarantinable disease so that proper action could be taken. The yard's share in this arrangement is met by safeguarding the city from any source of infection or contagion which may come under the jurisdiction of the Navy by the issue of general instructions concerning such diseases to service personnel and civilian employees alike; by the preparation of separate informative circulars concerning necessary precautionary measures in each of the several quarantinable diseases, which are issued to the civilian employees and any other persons on duty in the navy yard, and who, in accordance therewith, are required to report if one or another of these diseases has developed in a member of his family or in the house in which he is living. This information comes to the yard official either from the interested individual in person, by telephone, or by letter, or from the city bureau of health by post card, and all cases in the families of civilian employees, officers, or enlisted men living in the city, which come first to the knowledge of the medical officer of the yard, are immediately notified to the city health authorities by telephone and post card.

Finally, effort has been made to maintain relations of a cooperative nature between the navy yards and adjacent civil communities, both in the actual work of sanitary improvement and in the constant exchange of helpful advice and information looking to the abatement of any conditions prejudicial to health. This intercourse,

hough in some instances by letter, is on the whole free and in-
mal by telephone, or in person, and both parties benefit.

s regards the naval hospitals, much can be and has been done by medical department of yards to extend the facilities therein rep-nted outside of its immediate confines, and, also, to protect it n unnecessary demands. Both of these services have been ac-plished by the dispensaries of the yards under discussion, through r assumed capacity as buffers or intermediaries. in the one case ishing ambulance schedules and the types and the hours of out-ent services offered by the hospital; in the other case focusing, ng, and clarifying all demands upon the hospital.

e have attempted in the appendix to present a representative p of yard medical department publications, by which those ested are informed concerning, and kept in touch with, condi-and occurrences in the locality, and through which, in part, the ler field for the medical department of navy yards finds ex-ion.

ile in the conduct of the medical departments of the yards, have been our respective fields of duty, we have endeavored egrate the elements of the service on either side and to recog-ur responsibility and render service to both, the hospitals and ips are themselves not without certain responsibilities—each yards.

h hospital should advise the dispensary with which it has on concerning ambulance trips other than those scheduled, and changes in its routine of out-patient accommodations; and it also, as far as possible, make advance announcement to the sary of operations to be performed. so that visiting medical may be given opportunity to attend. The question of whether such information would be or is made use of frequently exercise no influence in determining a policy of placing the sional advantages of an active surgical clinic at the disposi-all who may care to avail themselves of them.

ship visiting a yard should promptly acquaint the dispensary ny case or condition developing on board which might in any volve the health of the station, or with any matter of sanitary t coming to its knowledge which properly concerns the medi-er of the yard, and it should also see to it that the garbage fuse equipment placed on the dock for its use, and its sur-gs, are kept in perfect sanitary condition. It should not be ry for the medical officer of the yard to make complaint to uch attention, and it is not necessary when the medical officer hip is properly alive to the comfort of his ship, as represented lecency of its immediate vicinity.

It would be an excellent practice and a means of gathering up many otherwise loose ends if medical officers of ships visiting navy yards would, as soon as possible after arrival, get in personal touch with the medical officer of the yard, to advise him of conditions aboard ship and to acquire a broader and more detailed view of the station and its vicinity than it is possible to give in a written communication.

In the offices of the medical officer of the yard at the Boston and Philadelphia yards are displayed large maps of the city and its suburbs, on which, by the aid of colored pins, the exact location of all communicable diseases is definitely shown; and, as this is kept posted daily by means of reports from the various boards of health, it furnishes an absolute guide to anyone wishing to know the health situation. This map was originally planned for the benefit of visiting medical officers, but has been found of great value also for the tracing of diseases among the civil employees and others attached to the yard.

It is manifestly impossible, in view of the many other demands upon his time, for the medical officer of a yard to have such constant or frequent supervision of the innumerable matters and features of sanitary moment connected with a large station as is desirable to maintain the best conditions at all times. Under existing circumstances the medical officer has no official assistance in these directions. A sanitary inspector could be employed to great advantage, but in the absence of such a representative of the medical department who could give his whole time to field sanitary work of varied character, the services of the master of the yard or foreman of yard laborers, if he has any genius in this direction, may, with the permission of the public-works officer, be informally enlisted. He is constantly going about the navy yard; he has all the laborers on maintenance under him; and he is responsible for the general conditions of the Government premises, including sewers and toilets. The identity of what is at least superficially sanitary, with what is pleasing to the eye, is patent even to the uninitiated, but the less obvious sanitary requirements can be shown to be important to the completeness of his task, and with tact he can be interested and instructed along these lines. One of the most useful books for this purpose is the elementary Primer of Sanitation, by Ritchie. This alliance with the master of the yard is not, of course, necessary in order to secure the correction of defects, but it will foster an enthusiasm, insure a more hearty cooperation, bring quicker results, and obviate the necessity of continually bothering an already busy commandant with matters which though important sanitarily speaking, are trifling in an official sense. What most commandants are looking for is results, and if these can be given them without too much fuss

display when their authority can reasonably and properly be as-
ed or is understood, so much the better. Needless to say, the com-
dant must be kept advised; but this can be accomplished by
onal interviews at appropriate times, or through the medium
he monthly report.

has been the practice at Philadelphia, as it was in Norfolk,
r to make any but the broadest and most general recommenda-
in these reports; and outside of embodying in them up-to-date
mation concerning matters of standard health interest, they
consisted of a review in brief of observations and progress
, and of the subjects of specific recommendation submitted by
oranda from time to time during the month, as the need de-
ed. Such memoranda may be of two classes, (A) concerning
ts or improvements which will be of little or no expense to
t or make; and (B) concerning necessary or desirable improve-
for which sufficient money is not at the time available and for
allotment or appropriation should be asked. They save the
al officer's ideas on any subject from being lost sight of in
ass of other material, and constitute the means for a convenient,
ly defined presentation of each separate matter, which the
andant can consider on its merits and refer to this or that
on head for action. It seems always well to lay the more
tant of these before the commandant in person, so that they
ot be lightly passed over in the general pile of correspondence,
lain any point that may be obscure, and to give them that per-
touch which often helps to secure fair way. Moreover, it has
ur policy never to make recommendations on any subject until
g practices have been studied, and all the conditions bearing
it, including the disposition of those who are going to be
d by the proposed change, have been given due weight, and
o approach the ideal only so far as it comports with the
al, from the point of view both of available money at the
tion of the public-works officer and of material obstacles.

lly, the medical officer should see to it that his division is a
ghly cooperative and dependable unit of the command. There
be no inertia requiring the prompting of the commandant.
uld be convinced by action that assigned duties will be per-
efficiently and expeditiously; that he may look with con-
for results; and, once an order is given, he may dismiss the
from his mind in the interest of other constantly appearing
g problems, in the knowledge that the matters so entrusted
nedical officer will in due time be brought to his attention
oleted form for final action if need be. The administrative
a large establishment like a navy yard is too busy to have to
mind or keep before him the hundred and one matters under

his jurisdiction connected with its operation. He has a right to expect his subordinates to exhibit a sense of responsibility, and to relieve him of such a necessity, once he has given an order or expressed his desire and explained his purpose in either.

While effort has been made to employ advantageously the latitude of our area of discretion in the manner we have attempted to outline, it must be remembered that there is room for improvement and perhaps modification. The foregoing is merely a review of what two individuals have done, embodying suggestions which will have to be adapted to conditions at other localities. The underlying principles alone are fixed.

In conclusion it may be said that one's bearing in relation to others and the attitude one assumes toward a given task will go far to determine success or failure. A determination to do the best one can will open up unexpected vistas of interest and inject an enthusiasm into a seemingly dull and prosaic field of duty.

The very fact that one is exercising his own ingenuity, searching for new avenues of usefulness, and giving some service from his powers to originate beyond the strict letter of the regulations, gives birth to a subtly gratifying sense of contribution to that part of the public weal in which one's lot is cast; to a feeling of partnership, even proprietorship, in the increasing efficiency of the service.

APPENDIX.

[Types of several navy yard dispensary publications mentioned in foregoing article. The information to be presented and the manner of its presentation may vary according to the circumstances at a given station or the ideas of a given medical officer.]

SANITARY CIRCULAR.

For information of fleet surgeon, reserve fleet; surgeon of marine barracks; and surgeons of individual ships visiting the Philadelphia Navy Yard. (Issued with the approval of the commandant.)

1. WATER SUPPLY: The water supply of the navy yard comes from the Torresdale Reservoir which draws from the Delaware River. Reports of bacteriological examination of samples taken at the reservoir and at a point specially representative of the yard supply are received every week, and reports of chemical examination of samples taken at the reservoir are received every month. The last received chemical and bacteriological reports show the following:

Nitrates______	Total bacterial count______
Nitrites______	Average bacterial count______
Oxygen consumed______	Colon bacilli in 1 c. c.______
Chlorin______	
Alkalinity______	
Total hardness______	

This water can (can not) be used safely for drinking purposes without boiling. Any emergency need of boiling will be immediately communicated.

General health of the vicinity:

Epidemics:

navy yard--

Philadelphia ---

New cases of communicable diseases for the past week other than above
:

avy yard--

Philadelphia ---

----

nunicable-disease reports are received every week, and other special in-
ion concerning health conditions is received every month, or as emer-
equires, from the Bureau of Health of Philadelphia. New data concern-
er and contagious and infectious diseases together with developments of
interest in other directions are sent in supplement to this circular every
In addition a chart of diseases and their location by wards is kept
at the yard dispensary, and any officer desiring more detailed informa-
an is possible in this circular is invited to consult the above-mentioned

ere is no segregated "red-light district" in Philadelphia, and prostitutes
subjected to any medical inspection. The use of heroin and cocain in
nt past has been quite general throughout the tenderloin district, and
a very rigid law controlling the sale of these and other similar drugs
o force March 1, 1915, it remains to be seen how effectually the prac-
be controlled. It would be well to bear in mind the possibility of ob-
hese drugs illicitly by enlisted men when considering disorders brought
attention among them.

vholesome milk supply may be obtained from the following dealers
stablishments and products are inspected by the medical officer of the
d who have permits to deal in the yard:

Name.	Location.	Phone No.
----------------------	----------------------	----------
----------------------	----------------------	----------

k delivered in Philadelphia is required by law to be pasteurized, and
ts of bacteriological examination of periodic samples taken from the
lers entitle them to a high rating.

eral provision retail stores which are inspected and are satisfactory,
l sanitary in handling fresh products, are numerous in South Phila-
s elsewhere in the city. Attention is invited to the fact that many if
the truck farms, particularly in South Philadelphia, use "night soil"
er and that their products are sold all over the city. It is advisable
his in mind and as far as possible avoid produce from those farms
of a kind ordinarily eaten uncooked. Celery is particularly dangerous
point of view. A bill seeking to modify and control this practice
perative September 1, 1914, but in its practical application the bill
found to fall short of the needs in many respects.

hour for X-ray work at the naval hospital is from 10 to 11 a. m.
ept Saturdays and Sundays. Patients sent for X-ray pictures should
ed with a letter to the commanding officer identifying the case and
actly what is desired, so that there may be no delay or misunder-

7. Patients for Wassermann test should be sent to the naval hospital in time to be there between the hours of 2 and 4 p. m. Mondays and Thursdays. They should be provided with a letter identifying the same and making specific request for a Wassermann test.

8. The medical officer of the yard is in daily receipt of information concerning the activity of surgical clinics throughout the city, and any medical officer who desires and can make arrangements to attend them will be given detailed information concerning the hospital; the number and character of cases, the hour of operation, and the operating surgeon. There are always a sufficient number of interesting cases of various kinds to be operated at any one place each day to insure a profitable morning or afternoon without the need to go from one hospital to another. It is a mistake not to take advantage of such an opportunity when in a big medical center like Philadelphia. Medical officers not familiar with Philadelphia can also obtain information at the yard dispensary concerning other matters of professional interest, including the names and addresses of specialists in various subjects. Data on safety and safety devices are also on file at the dispensary and available to those wishing to consult them.

9. The yard dispensary is equipped with a lungmotor for performing artificial respiration which is available when necessary, upon call, day or night.

10. Attention is invited to paragraph 156 of the Navy Yard Regulations with particular reference to garbage disposal. Medical officers will contribute greatly to the comfort of their ships and to the sanitary condition of the yard if they will take an interest in the care with which garbage is disposed and the tidiness and the cleanliness of garbage racks and receptacles and their vicinity.

11. Attention is also invited to paragraphs 100 to 113, inclusive, of the Yard Regulations, dealing with subjects of interest to medical officers.

WEEKLY SUPPLEMENT.

Sanitary Circular.

For the information of fleet surgeon, reserve fleet; surgeon, marine barracks; and surgeons of individual ships visiting the Philadelphia Navy Yard. (Issued with the approval of the commandant.)

1. WATER SUPPLY: The water supply of the navy yard comes from the Torresdale Reservoir, which draws from the Delaware River. Chemical and bacteriological examination for the week ending September 5, 1914, is as follows:

Nitrates	0.18	Total bacterial count	25
Nitrites	.011	Average bacterial count	12½
Oxygen consumed	1.15		
Chlorin	5.2	Colon bacilli	1 c. c. negative.
Alkalinity	39.00	Colon bacilli	10 c. c. negative.
Total solids	63.00		

This water can be used for drinking purposes without boiling.

2. General health of the vicinity:

(a) Epidemics:

In navy yard, none.

In Philadelphia, none.

) Communicable diseases other than above stated (new cases reported he past week):

navy yard, none.

Philadelphia: Measles, 17; whooping cough, 17; diphtheria, 18; chicken- 8; scarlet fever, 7; typhoid fever; 27; scattered throughout the city—no cular concentration.

TE.—At the request of the naval hospital you are asked, as far as may be ble, to limit the transfers of venereal and other nonemergency cases to tal to Tuesdays and Fridays. These two days are regular discharge days e hospital, requiring the ambulance to come to the yard, and by observing bove request extra trips by the ambulance may be avoided. Of course the lance can be called for emergency cases on any day.

e hospital has advised for the present its X-ray apparatus is out of com- on. As soon as the new one is installed and the hospital is ready to do work a notice to that effect will appear in this circular.

MEMORANDUM NO. A-1.

ommandant concerning matters of sanitary moment involving little or no e. Submitted by medical officer of the yard.

ject: Certification preliminary to dental treatment.

ttention is invited to the fact that there is very great danger both to the surgeon and his subsequent patients should he unwittingly operate upon of syphilis or other infectious or contagious disease. It is therefore nended that some such order as the following be issued:

In order to prevent the possibility of infection, all slips made out by l officers recommending dental treatment will state over the medical signature whether or not the bearer is being treated for syphilis or nfectious or contagious diseases.

following form will be used:

U. S. S. ______________________

for Executive Officer.

____________________, ________, is in need of dental services. It is recom-
(Name) (Rate)

that he be permitted to visit the yard dentist at ________, ____________.
(Hour) (Date)

(not) under treatment for syphilis or other infectious or contagious

______________________,
Surgeon, U. S. Navy.

ved:

______________________,
Executive Officer.

MEMORANDUM NO. B-1.

mmandant concerning a matter of sanitary moment, involving more expenditure of money. Submitted by the medical officer of the yard suggestion that as money is not now available for putting the recom-

mendation into effect it be considered in connection with the preparation of estimates for the next appropriation, and be kept in view for that purpose.

Subject: Equipment for garbage and other refuse disposal.

1. The provisions for the disposal of garbage and other refuse from visiting ships seems to be inadequate, and leaves much to be desired from the point of view of both sanitation and sightliness.

2. It is recommended, therefore:

(a) That 12 open bins be constructed according to the appended specifications and placed—one at each usual ship's berth and dry dock for the disposal of bulky dry refuse.

(b) That 12 garbage-can racks be constructed according to appended specifications and placed—one at each ship's berth with the bins.

(c) That twenty-four 50-gallon galvanized cans be made or purchased and placed—two at each ship's berth for paper and other light refuse.

3. Rules will be suggested for the use of the equipment as soon as possible.

HEALTH BULLETIN NO. 1.

U. S. Navy Yard, Philadelphia, Pa.,
March 9, 1915.

In view of the occasional sporadic development of cases of smallpox and the presence of other contagious diseases in Philadelphia, the close contact of people of all classes on the street cars, and the inability of families resident in the yard to determine (even if that would indicate anything) the districts of the city visited by their domestic servants, and, moreover, in view of the fact that domestic servants come in closer and more intimate contact with officers and their families than any other employees, and may thus be sources of various infections, attention is invited to the following:

1. That it is desirable that all domestic servants in the navy yard (not enlisted men of the service) be vaccinated, as a protection against smallpox.

2. That it is desirable that all cases of illness, especially when accompanied by sore throat or eruption, among domestic servants employed by the families in the navy yard be brought to the attention of the medical officer of the yard to determine the presence or absence of communicable disease.

These observations are communicated solely as a matter of information to all concerned; and, for various reasons which it would be impolitic to enumerate in a public bulletin, are not published in the form of an official order.

The medical officer of the yard and his assistant tender their services in these several directions of public-health import, and in order that the inevitable difficulties of the attending circumstances which are recognized may be reduced to the minimum, the suggested vaccinations and examinations will be conducted with every consideration for the subject.

Should any of the residents of the navy yard desire and see their way clear to act upon this information and avail themselves of such services, they are advised that the yard dispensary is open from 9 a. m. to 4.30 p. m. In case of illness, should the individual be too sick to leave the house, a visit will be made upon request.

HEALTH BULLETIN NO. 2.

Navy Yard, Philadelphia, Pa.,
May 28, 1915.

th the approach of warm weather there are a number of important matters g a direct relation to health which should receive the renewed considera- of all, particularly householders. A little persistent effort in the several ions to be mentioned will mean much in the interest of both comfort and ı.

k is the most wholesome of food, and yet it is capable of being the most rous unless properly produced and handled. All milk sold in the city uired to be pasteurized and then cooled to 50° F. and kept at or be- at temperature until delivered within 24 hours. Everything possible ng done to insure a clean, wholesome supply of this food to the navy The medical officer of the yard will be glad to take up and investi- ny legitimate complaint against the milk dealer. All precautions up to ne it reaches the consumer, however, may go for naught if certain simple re neglected. It is just as necessary to keep the milk clean and cool at s to request care from the dealer. To bring the necessity of the observ- f these simple rules more clearly to mind, you are advised that the vari- nds which handle the milk bottles after they have been sealed up may l unquestionably often are, soiled with all kinds of matter, which, in ance with the usual method of handling, is transferred to the mouth of tle. Moreover, in the process of transportation the dust of the streets lates at the mouth of the bottle, and flies may contaminate it. The failure to carefully wash the bottle, and particularly its mouth, before g the seal and pouring the milk out has itself been responsible for cs of typhoid fever and many cases of tuberculosis, diphtheria, and fever, etc. Moreover, in the face of the ever-present possibility that will get into milk in one way or another, it is to be remembered that an excellent culture medium and that germs increase rapidly to a dan- number if the milk is allowed to get warm.

rst rule, therefore, is that milk bottles, particularly the mouths, should ully washed before the seal is removed, preferably as soon as received, addition, the mouths of the bottles should be wiped off with a clean oth each time thereafter when milk is to be poured from them.

econd rule is that the milk receptacle, whether bottle or pitcher, should covered, even in the ice box, to prevent the access of dust and flies and Rinse the cap in clean running water before replacing. If the cap broken, place an inverted tumbler over the mouth of the bottle.

iird rule is that milk should be put in a separate compartment in the immediately after it is received, and kept there; not allowed to stand for an indefinite time where it will get warm. If this for any reason be done at once, place a box containing a lump of ice on the porch or to receive the milk. Do not pour back into the bottle or pitcher unused ich has been exposed to the air or otherwise contaminated, as it will rest of the milk. Household receptacles for milk must be kept scrupu- ean. After use these utensils should be rinsed, scalded, and set away bottom upward, to dry, as they are kept in much better condition than when washed in dishwater and wiped with the ordinary dish Scald the milk bottles before returning them to the dealer. After all y film has been removed by cold water, wash carefully in hot water

and stand the bottle upside down in a clean place to dry. Insist that the milkman shall remove all bottles daily. Under no circumstances use milk bottles for turpentine, vinegar, kerosene, or for any liquid other than milk. Are these simple rules observed in your house? If not, they are worth enforcing, particularly in households where there are children.

Flies are enemies to comfort and health which will soon be with us. The manner in which they convey disease germs to food by their feet and "fly spots" is such common knowledge that it need not be discussed here, and the prodigious rate at which they multiply—even from a single fly laying 120 eggs at the beginning of the season—must be apparent to all.

What can each one do to protect one's self, and help, if not to eliminate, to reduce the pest?

First. Provide wire-gauze "swatters" and kill those flies which have hibernated in the house over winter before they can start the season's breeding, and then throughout the summer kill all those that gain entrance to the house.

Second. See to it that there are no breeding places on the premises. The process of development from the egg to the fly takes from 10 days to two weeks, and the materials favorable to breeding are: Horse manure (especially in a moist, fermenting condition), particles of garbage, decaying vegetables or refuse, the litter of chicken coops and yards, and even heaped-up masses of waste paper or old rags. Damp, rich mushroom beds in the cellars of houses are to be considered in this connection.

Third. Keep all foodstuffs, especially the cooked articles or those that are to be eaten raw, protected from the flies by wire-gauze covers or otherwise.

Fourth. Open only those windows or parts of windows that are screened, and keep the screen doors closed.

Mosquitoes are also pests and disease carriers which should engage the united active antagonism of all. The navy-yard authorities are carrying on an anti-mosquito campaign. The authorities of Philadelphia are doing similar work in the district adjacent to the yard. What can the individual householder do to help?

Report any unoiled accumulation of water that comes to his notice and be careful that there is no standing water, as in cans or pails or other water containers, on his own premises, for such water would offer a breeding place for mosquitoes. Also report any torn or otherwise ineffective window or door screens.

The water supply is perfectly safe and potable without boiling and can be drawn directly from the taps for drinking. In case of an epidemic or outbreak of communicable diseases liable in any way to affect the water, or in case of its pollution from any other cause, the dispensary would at once be notified and warning given to all concerned. A report of bacteriological examination is received each week and of chemical analysis each month.

Attention is invited to the fact that many of the truck farms of Philadelphia are fertilized with night soil. This should be borne in mind when purchasing vegetables, particularly those usually eaten uncooked, and care taken that these are thoroughly washed before serving, as a precaution against those stomach and bowel disorders frequently conveyed in that way.

THE HOSPITAL STEWARD; CONCERNING HIS QUALIFICATIONS—PERSONAL, EDUCATIONAL, AND PROFESSIONAL.

By W. E. EATON, Passed Assistant Surgeon, United States Navy.

The object of this paper is to place before the medical officers certain information and suggestions which it seems impracticable to present in any other way. It is the desire of us all to raise the Hospital Corps to that highest standard of efficiency of which the medical department may justly feel proud. The major portion of this efficiency is determined or influenced by the chief petty officer. The inefficient and objectionable chief petty officer has a bad influence on those under his direction. The greater ability of the efficient chief petty officer is recognized by those in the lower ratings and under his direction, and through observation of his work the apprentices are influenced to perfect themselves in their duties and to perform these duties in a satisfactory manner. The hospital steward has to do with the life and health of the individual and the treatment of disease or the administrations of medicines which, unless carefully conducted, may cause the death of the person concerned. This duty may be performed under direction or not under direction.

The hospital steward is frequently on isolated duty and the sole representative of the medical department. He is the only available means of medical attention for both enlisted men and officers. He is frequently stationed by necessity where grave accident is liable to occur and therefore must be familiar with first-aid, a certain amount of emergency surgery, and must have a full knowledge of the duties of his rating—to know what to do and what not to do.

On expeditions with the landing force he is an essential factor in obtaining and maintaining the best possible sanitary conditions. He is in this particular of greatest assistance to the medical officer, especially when he is a steward of the highest type of knowledge and efficiency. On such expeditions it may be necessary for him to assume the activities and duties of a medical officer, such as has been recently reported. One performed an amputation of a thigh and also an operation for depressed fracture of the skull. Such men, therefore, must be resourceful.

In hospitals and on large ships he must oversee the care of the sick, the management of the sick bay, and the care for large amounts of valuable stores, maintain discipline, etc.

It may therefore be readily seen that the hospital steward holds one of the most important ratings of all chief petty officers and should have such a thorough knowledge of his duties as to make him absolutely reliable and the highest type of chief petty officer. To obtain this knowledge and experience requires time, study, enthu-

siasm, and diligent attention to the work. Uncertain knowledge can not be tolerated, nor can advancement to the rating of hospital steward be recommended until the candidate has become fully qualified to meet all demands of this most important rating. It is believed that only those who have enlisted in the lower ratings and have come up through the various training schools, hospitals, ships, etc., to their present service, knowledge, and experience make the most satisfactory chief petty officers.

How, then, may we determine the qualifications of such men as seem desirable for this rating?

It is not the purpose of this paper to direct what examining boards shall ask candidates, but, with the experience of reviewing and correcting many examination papers and an observation of the faults and shortcomings of these examinations, to suggest such examinations as will be of a certain standard and completeness and which will adequately present the knowledge of the candidate and determine his capability for the rating of hospital steward.

Who are eligible? Owing to the particular and necessarily high character of the duties performed by the hospital corpsmen wherein personal knowledge and experience play a very great part, a different method must govern their advancement than pertains in the seaman branch. No man is considered eligible or to have gained the proper knowledge to qualify him for the rating of hospital steward until he has served at least two years in the rating of hospital apprentice, first class. It is believed that in no shorter time than this can the candidate attain eligibility, as the duties are such that considerable experience must be gained, not only in naval customs and paper work, but also in nursing, administration of medicines, and general care of the sick and hospital wards and property, before one is qualified for this high rating. It is believed that promotion to the rating of hospital steward should not occur until the man is serving in his second or subsequent enlistment (as in the case of chief petty officers of other branches).

The first points to be considered are the candidate's personal qualifications. These should be obtained by a review of the statement of qualifications for hospital steward (new form letter), which, it would seem desirable, should be accompanied by a letter from the examining board giving a general statement of the board's impression of the candidate. The letter from the medical officer under whom the candidate for hospital steward is serving should be more than a brief perfunctory statement. Such a letter is valueless as an aid to the reviewing examiner, as it conveys no information by which a decision can be reached. This statement should be viewed and written by the medical officer concerned as a serious and impartial one. Does the man meet every requirement demanded by the doctor himself, and, in

dition, would he probably meet the requirements of other medical cers, and also those of an independent duty?

This previous letter, which frequently was not submitted at all, or, best, was most unsatisfactory, has now been replaced by the new m letter "Statement of Qualifications for Hospital Steward." In statement the following 10 questions have been asked:

Is he attentive and studious?

Is he bright and active and does he show good judgment?

Does he show an apparent thorough knowledge and understand- of the duties of the Hospital Corps?

Does his work indicate that he has originality and initiative?

Is he orderly and neat in his work, surroundings, and person?

Is he military in bearing, and dignified and painstaking in the ormance of duty?

Has he ability to control men and maintain discipline?

Does he bear or assume responsibility readily and in a trust- hy manner?

Do you consider him a sufficiently satisfactory, competent, re- e man to hold the rating of hospital steward, and one who is, in opinion, unquestionably qualified for and who could be de- ed upon in any assignment, independent or otherwise, in con- on with the duties of his rating?

Would you willingly and with justifiable confidence accept him uty under your direction as your hospital steward?

us points are brought out in this statement which may have a ng on the man's appointment, whether or not he passes the writ- xamination. It can be readily understood that a man might pass ritten examination in a creditable manner but be totally un- for the rating of hospital steward. It is therefore desired that orms for this statement of qualifications for hospital steward d be obtained from the Supply Depot and forwarded in the case h man examined.

sonally, therefore, he must be a man of good education and ss, strong character, firmness, initiative, and have a reliable of duty. He must be at all times neat and military in his per- appearance, about his quarters, and in the performance of his . There must be no question as to his ability and dependable- He must have a level head, common sense, and coolness, and ntrol in an emergency. He should be quick to perceive and pate possibilities and probabilities in any situation. The man's ality, character, and general type should be one fitted for this of work.

, as to the educational qualifications. Hospital corpsmen are ed to have a certain preliminary general education and to pass mination in it before enlistment. This is a very essential point

in the qualifications of a hospital steward. Reference is here made to the revised "Examination Report, Hospital Corps, United States Navy." It is desired that under the preliminary education and training the blank spaces should be filled out and the preliminary education of the candidate adequately determined. The general education of the candidate must be given serious investigation. The candidate should be required to make a written statement of his preliminary studies, which should be supported by suitable evidence brought out adequately by the examining board in their questions. In this connection reference is invited to my article on the new forms concerning the Hospital Corps, page 300 of this issue.

In view of the great amount of clerical work performed by the hospital stewards, poor spelling and grammar should be frowned upon. In this way only can the men be encouraged to study and perfect themselves in this particular branch.

Frequently men apply who have had training in pharmacy, dentistry, or a year or two of study at a medical school. Some have training in nursing. The fact that such men have had this training is no indication that they will be satisfactory hospital corpsmen without additional training of a service character. Frequently men are desired for such detail work as laboratory procedures, for which a very good general and high-school education is essential.

Professional qualifications: This portion of the examination is open to great latitude. Some of the examinations are of great length, while others are too short to be of value. Greatest care must be taken to determine the manual and mental capabilities of the man.

From a review of the papers of many candidates it would appear that the questions asked vary considerably and often are not of a character to bring out or adequately present the candidate's knowledge. The questions are frequently so impracticable as to make it difficult to determine or judge from the answers whether or not the degree of comprehension of the various subjects and duties is sufficient to warrant issuing to the candidate an acting appointment as hospital steward. It is noticed from time to time that, while the man may have answered fairly well such questions as he was given, no clear picture of his knowledge of the duties—such as actual nursing and administrations of medicines in proper doses, etc.—can be obtained. In such cases it must needs be the duty of the bureau to reject the candidate as a precaution against future incompetency and complaint, or until such time as each man in question has again been examined and his fitness more conclusively determined. This explains in one way why now and then an apparently competent and acceptable candidate who is expected to pass is reported as not found qualified. It has been repeatedly noticed that hospital apprentices, first class, who perform temporarily the duties of a hospital steward

apparently have sufficient knowledge to qualify them for this ng, do not show up well when given a written examination on subjects in question. Most of these men have an elementary or erficial idea of the entire situation, but would be most untrustthy on independent duty. While under the direction of one wing the ropes they serve satisfactorily. As soon as removed this influence they fail. A candidate who has been in the servrom six to eight or more years should show much more familiy with his duties than one who has been in service but two or years. This point is always taken into consideration in reing the papers. It is most important that the candidate's ledge in the four essential subjects, minor surgery, first-aid surgical technic, nursing and materia medica, elementary hyand clerical forms, should be very thoroughly brought out. ntly in one examination 30 questions each were asked in pharand chemistry, while in materia medica three very inconseial questions were asked.

us now consider the five main portions of the professional ination. The examinations in anatomy and physiology are or less unsatisfactory. It would seem best in anatomy to ask stion on bones, a question on joints, a question on the muscular ures, a question on the viscera, and one general question, making all; in physiology, one question on the general bodily funcand one on the function of some individual organ. In this way eral idea of the man's knowledge of the two subjects may be ed. The questions in physiology should be of a simple and ntary character. Frequently questions have been asked which deep and require too much knowledge to be answered by the ate. We must remember that these candidates are not physi- It would seem that the questions in anatomy should refer to which will come up in minor surgery.

or surgery and first-aid should include the knowledge of surgissings, operating-room technic, and operating-room surgery. surgery should take up the question of opening abscesses, g ulcers and burns, dressing large infected wounds, and such as would occur in their daily experience in the sick bay and l, the application of suitable splints to fractures, the various of stopping hemorrhage; more of a knowledge of the minor es rather than the big things which occur in first-aid and t work. It must be remembered that such knowledge and such gs as will be applied by these men are only temporary meastil a medical officer can be consulted or can attend particu- the large cases. Many stewards know practically nothing he operating-room technic, the sterilization of instruments, ation of dressings, sterilization of hands, etc. They are un-

able to pick out surgical instruments, to organize the work within the operating room, to properly safeguard sterile objects, such as instruments, water, etc. Questions on the work which they daily perform are seldom asked. The object of this examination should be to make it as practical as possible upon the work in which the man has had or will have considerable experience.

Questions on nursing and materia medica are seldom such as bring out the knowledge of the candidate as to what he would do in the care of special cases and the administration of medicine. It is much to be preferred that a man be asked the means by which he would nurse a case of pneumonia, typhoid fever, appendicitis, or large surgical case, how he would administer medicine to such cases—by mouth, by hypodermic, by rectum, etc.—than to know whether he knows enough to open the windows and air the ward (which is a question frequently asked). It can be readily seen that when the entire examination consists of several questions, like ventilation of a ward, the routine of the day in a ward, the making of beds, the proper disposition of the furniture within the ward, etc., having nothing to do with the direct treatment of disease, little can be learned of the man's ideas of nursing. It has been noticed that a man may be entirely familiar with the routine of the ward, the ventilation of the ward, etc., but when it comes to answering definite questions on the care of a case he knows nothing about it. The questions on ventilation of the ward, etc., should appear in the section on hygiene. Therefore it is desired that the board obtain evidence that the candidate knows how to care for a case of disease and to administer medicine in the proper doses and in the proper manner.

The questions in elementary hygiene should consist of those on the personal care of themselves and the personal care of patients, the question of suitable ventilation, and, in the field, questions on a safe water supply and the proper disposition of waste. In other words, all questions in this subject should be of a practical character which men will be required to know in the performance of their duties in a hospital, on board ship, and in the field.

It will be noted now that hospital apprentices, first class, are required to know something about clerical forms and procedures. These men are frequently on isolated duty or are the only clerical force available for the medical officer, and frequently they have to make out letters and forms for the ship or for this officer. It is not expected that hospital apprentices, first class, will know as much about forms as the hospital steward. Many hospital stewards know very little about forms or their suitable preparation and appearance. Many hospital stewards are unable to write a satisfactory letter in the way of correspondence. It would be advisable to obtain a written

letter from the man and the filling out of a number of the simpler forms rather than the elaborate forms "F" and "K." Forms "F" and "K" seem to be the ones picked out in nearly every examination. It is therefore evident that he must be required to be familiar with the handling of all correspondence, the regulations governing the same, and regulations relating to enlistments, transfers, and discharges of the hospital corpsmen, at least, if not others also.

Frequently the subjects of pharmacy and chemistry are gone into too extensively. The questions in pharmacy should bring out the candidate's knowledge of the simple daily procedures in the preparation of medicines and solutions, rather than going into the long processes of percolation, etc., which is frequently done. Long, involved questions in organic chemistry and forms of chemical procedures should be avoided. The examination of urine, stomach contents, etc., which may come to the steward at any time should be preferably asked rather than some of the involved chemical questions which are now given to candidates. It is seldom that candidates are asked questions on the examination of urine, stomach contents, etc.

The questions under diet and messing for the sick should contain those upon obtaining and preparation of suitable food for the sick while in the wards, and particularly in the sick bay aboard ship. The ignorance and irregularity of hospital stewards in this particular are noticeable. They may show no originality or resourcefulness in the preparation of foods or the selecting of suitable foods for their cases. It is believed that this feature of the hospital corps work should be given particular attention and by aid of suitable talks and demonstrations developed to a satisfactory service.

Eminent fairness pervades the reviewing of the service records, statements of qualifications, examination papers, and subsequent consideration of the results thus obtained.

Upon receipt of the service and examination papers in the bureau, the man's record is carefully gone over; the statement of qualifications (new form) is obtained and carefully considered; the questions of the examination are carefully gone over and marks credited to each subject. When the papers in each case are received they are placed in order of the date of the examination appearing on the examination report; that is, the papers are arranged chronologically. The same method is used in filing the precedent cards on the eligibility list. Should there be several candidates examined on the same day, length of service determines their place on the list. Should a man who is not eligible be examined, the papers are not given further consideration, but are returned to the examining board or commanding officer with a statement to that effect.

When a demand for a hospital steward arises and there is no hospital steward available an acting appointment is recommended for the first man on the eligible list. No appointments are issued when hospital stewards are available. Upon being first appointed, hospital stewards are detailed to destroyers or to small ships for a year to a year and a half, possibly two years.

The following policies are in vogue:

Only the hospital steward who holds a permanent appointment and who reenlists within four months of honorable discharge is reenlisted in the rating of hospital steward.

A hospital steward who holds an acting appointment and who reenlists within four months of honorable discharge is reenlisted in the rating of hospital apprentice, first class, and reissued an acting appointment at once, provided he is considered desirable and is entitled to an acting appointment.

A hospital steward, whether holding an acting appointment or a permanent appointment, who has been out of the service over four months from date of discharge will not be reenlisted as hospital steward. He may reenlist as a hospital apprentice, first class, only, and must pass through the eligibility period, be reexamined for the rating and await promotion in his turn, as shown by the eligible list, as is the case with newly applying candidates. (Bu. Nav. Circ., Jan. 1, 1916.) This policy was found necessary in fairness to all, to those who are endeavoring to gain promotion, and to encourage men to remain in the service, to discourage discontent, questionable interest in the work, and dissatisfaction.

A hospital steward who has been disrated for any reason and who seeks reinstatment must serve in the rate to which reduced or he may be promoted if recommended to the next higher rating. Thereafter he must pass through the successive steps of advancement, be again examined, and his qualifications determined before reinstated in his former rating. His date of precedence also is necessarily changed. This policy has become necessary in order to determine the man's character, and whether or not his behavior, conduct, and knowledge are sufficient to warrant reissuing him his appointment. No hospital steward so promoted will be recommended for a permanent appointment until he has served one year satisfactorily in an acting appointment.

No candidate is considered eligible or to have gained the proper knowledge to qualify him for the rating of hospital steward until he has served at least two years in the rating of hospital apprentice, first class.

It is therefore urged that medical officers fully and seriously consider and recognize the great responsibilities of and high qualifica-

tions required for the hospital steward rating, and the need of greatest care and foresight in the selection and recommendation of only desirable, competent, well-trained men.

STUDIES PERTAINING TO LIGHT ON SHIPBOARD.

II.

By T. W. RICHARDS, Surgeon, United States Navy.

In a previous communication on this subject[1] consideration was given to certain broad principles of illumination, and it is the purpose of the present paper to inquire regarding the practical application of these principles to conditions on shipboard. To this end it will be convenient to discuss the quantity and quality of artificial light available and also to determine, so far as may be, its distribution. While this last factor is, perhaps, the most important of the three it is also, unfortunately, much the most difficult and can not be given adequate analysis in these pages for reasons already indicated and which will be sufficiently obvious.

While the total amount of light available within a ship or even a single compartment is not necessarily an index of the quantity reaching the eye when and where it is needed, nevertheless a certain minimum is indispensable, and as we are concerned, for all practical purposes, only with electrical installations this becomes primarily a question of power, or, in the last analysis, fuel.[2] Undoubtedly there have been occasions in the past when undue economy in the expenditure of coal has operated to the detriment of our ocular apparatus, but with the present large plants on shipboard, and perhaps more general recognition of hygienic necessities, such occurrences are rare; when occurring they are apt to be due to overzealousness in the engineering competitions. If I understand the rules aright every pound of coal saved is an advantage in making up the ship's final record, no matter what the sacrifice may be, and if the dynamos could be shut down entirely no statistical penalty would be involved, but quite the

---

[1] U. S. Naval Medical Bulletin, x, No. 1, January, 1916.

[2] Looked at solely from a commercial point of view electric light can not be considered very economical; it still costs some three and one-half times as much as gaslight despite the fact that the ordinary tungsten lamp is about 11 times as efficient as the inverted mantle gas burner. But contrary, perhaps, to general opinion, economies in gaslighting have developed during the past 10 years in a much greater degree than with the newer illuminant (in the ratio, it is said, of about 2½ to 1). While all this, perhaps, has no very direct bearing upon the subject at issue, it may be as well to record the fact that, upon occasion, gas has been used for lighting purposes on board vessels of our Navy. The first ship upon which the writer ever served—the old frigate *Minnesota*—was at one time illuminated, in part, from the New York City mains. However incongruous this may seem, we certainly found it a welcome supplement to the dismal oil lamps, glowing fitfully from their shadowy corners.

reverse. I am therefore of the opinion that the rules should be so amended as to provide for a definite but reasonable allowance of fuel for lighting purposes, with a penalty for *excess* but no premium for a *smaller* expenditure.[1]

As a matter of fact, the power utilized on shipboard solely for the lighting circuits, while considerable, really constitutes a very small percentage of the whole expenditure. On the *Florida*, for example, during the quarter ending August 31, 1915, it amounted to 140,450 kw. h., an average of some 63 kilowatts, or, at 125 volts, a continuous lighting load of about 505 amperes; this is probably a fair average, though the ship was in New England waters where the days were prolonged. Nevertheless, that this represents a great amount of light, is readily apparent. Thus, Gatewood states that "at first there was one 16-candlepower lamp to about 1,000 cubic feet in crew spaces. The tendency now (1909) is to place one such lamp in each 500 cubic feet." Now, if the *Florida* were an empty shell it would be entirely practicable, with the current available, to furnish continuously, day and night, 16 candlepower to each 665 cubic feet of the *entire hull, forecastle, and superstructure.* Of course there is actually no such uniform distribution of light either in space or time. There are many compartments, such as storerooms, coal bunkers, double bottoms, etc., where the amount is much below this average, and the load is, furthermore, naturally greatest from about sunset to 9 p. m., and lowest between midnight and 3 a. m. The diurnal fluctuation, however, is less than might be anticipated; thus, 24 consecutive, hourly observations made in August showed that the highest and lowest hourly expenditures between 8 a. m. and 8 p. m. averaged 510 and 450 amperes, respectively. After 10 p. m. there is a decided drop and the load only averages some 300 amperes from that time until dawn, when it rapidly increases again with renewed activity of the personnel.

I have given these data somewhat at length, as I think they indicate quite clearly the very great dependence we place upon artificial illumination even during the hours of broad daylight.

At any rate, it is quite certain that the amount of light potentially available in the living spaces of the *Florida* is decidedly in excess of the estimate of 1909, probably owing to the fact that her lighting installation, like that of nearly all our ships, was originally designed for the carbon-filament lamp, which, however, has now been largely replaced by the tungsten apparatus. Moreover, there is a general tendency to add lamps here and there to the various circuits, some-

[1] Of course the same principle applies to the distillation of water, and with about equal force. Allowing seven pounds of coal per kilowatt hour it appears that the *Florida's* daily expenditure for lighting is about $4\frac{3}{4}$ tons. A similar expenditure for distillation would yield rather more than 10,000 gallons daily.

es quite needlessly, as long as a ship remains in commission, and following list of lamps actually in use probably exceeds materi- the original allowance:

Type.[1]	Number in use.	Watts.	Candle-power.
ten (Mazda)	24	250	220
.	13	60	51
.	177	40	32
.	977	25	20
.	15	100	32
.	898	50	16
y vapor	8	(?)	(?)

many of the older vessels arc lamps were installed in the firerooms, but this has not been the practice nt years, and I am informed that on our newer ships (*e. g.*, *Arizona*) the only high-power lamp d in the regular equipment is the 250-watt tungsten, with nitrogen-filled bulb. This new lamp is be fully twice as efficient as the type having a vacuum bulb, consuming, perhaps, only 0.5-watt llepower, but as yet it does not appear to be generally available in the smaller sizes. Other inert g., argon) are also being used in tungsten lamps, and the system gives promise of further develop-

will be seen from the above, many carbon lamps are still in use, retained on account of their lower cost and somewhat greater ility.[2] They are, in general, installed in storerooms or other artments where increased illumination is unimportant or in ons where vibration is deemed excessive (*e. g.*, dynamo and en- ooms). It should be noted, however, that the extreme fragility tungsten filament, which so long delayed the general introduc- f these lamps on shipboard, has now been very largely over- During a recent target practice with 5-inch guns, when all nding lights were left in place (the shades being removed), hree lamps were broken on the gun deck and none, I believe, ere. Damage from the 12-inch battery was also insignificant, onfined to a few lamps above the main deck. I am informed fficer of the electrical department that upon one occasion after practice a lamp, mounted vertically, was found with filament and still burning, though the glass supporting rod had been and the fragments lay loose inside the bulb. As to vibration, t marked in turbine vessels, so that aside from the question omy there seems to be no serious objection to the newer type. re, however, certain differences in the behavior of the carbon tallic filaments which are of physiological interest. Thus on filament is about twice as sensitive as the other to changes ure, as indicated by light emission, so that fluctuations of should be less evident and disturbing to vision with the lamp. Light from the metallic filament is also decidedly " than that emitted from the carbon lamp, which is appre- ellowish. It is doubtful whether this difference is sufficient, ings being equal, to seriously influence vision, but the evi-

stand that the latest requirements specify tungsten lamps for all locations ex- with illuminating sets.

dence on this point, so far as it goes, seems to favor the tungsten lamp. The matter has been summed up by C. E. Ferree,[1] who states with some reserve, "that when intensity and distribution are equalized, an installation of clear carbon lamps, which gives a light comparatively rich in yellow and red, causes the eye to fall off more in efficiency as the result of three to four hours' work than an installation of clear tungsten lamps, the light from which is more nearly white." As the evolution of the eye has presumably taken place under the influence of daylight it would seem, theoretically at least, that this organ is best adapted to light of similar quality. A further advantage of the tungsten lamp is the fact that it consumes relatively much less current in the production of heat; close proximity to a cluster of carbon lamps adds appreciably to our discomfort in hot weather.

But with all due allowance for the above it must not be forgotten that the intrinsic brilliancy of the tungsten lamp (1,000 candlepower or more per square inch) is more than three times that of the carbon filament, and the problems of diffusion and distribution become correspondingly more urgent.

In the mercury-vapor lamp we have had an illuminant of very different type and one of special interest, owing to its peculiar spectrum and the opinion expressed by some observers that its use might be injurious to the eye owing to an excess of ultra-violet waves.[2] While I was at one time inclined to accept this view, personal experience with these lamps during the past year and a half and a more thorough review of the literature on this particular subject has satisfied me that the point is not well taken. This whole question of ultra-

---

[1] The Problem of Lighting in Its Relation to the Efficiency of Eye. Science, July 17, 1914.

[2] The mercury-vapor lamp is more nearly allied to the arc lamp than to any other type hitherto employed on shipboard. Nearly all illuminants agree, however, in the fact that the light emitted is mainly or entirely due to temperature radiation. Light may, nevertheless, be produced in other ways, and it is said that the Moore light is probably due to chemical reactions. Even now the production of light practically without heat is feasible as a laboratory experiment, and about 95 per cent of the firefly's radiations fall within our visible spectrum. "When mercury is made anode in a cold, fairly concentrated potassium bromid solution (25 per cent for instance), with an anode current density of about 2 amperes per square decimeter, the mercury first becomes coated with a film of bromid and then appears to glow with a brilliant orange light. This will last for at least 10 minutes, at the end of which time the film of bromid will have become so thick as to prevent the light being seen. The light can be obtained at as low a voltage as 3 volts, but the intensity is then very low. With increasing voltage—or, really with increasing current density—the intensity of the light increases, the upper limit coming when sparking takes place. The phenomenon is shown very well with a voltage of 24 to 28 volts. This is not cold light. It is not even a very efficient light. The importance of it lies in the fact that it is a striking illustration of the principle that reactions emit light and that a high temperature is not essential. * * * There is no immediate prospect of present methods of lighting being superseded; but the theoretical feasibility of cold light and the general conditions under which it is to be obtained have been demonstrated." In view of possible developments along these lines such questions are of great theoretical interest, at least, and the reader who cares to pursue the subject would do well to consult the paper quoted above, entitled "The Theory of Cold Light," by Prof. W. D. Bancroft, Scientific American Supplement, Sept. 18, 1915.

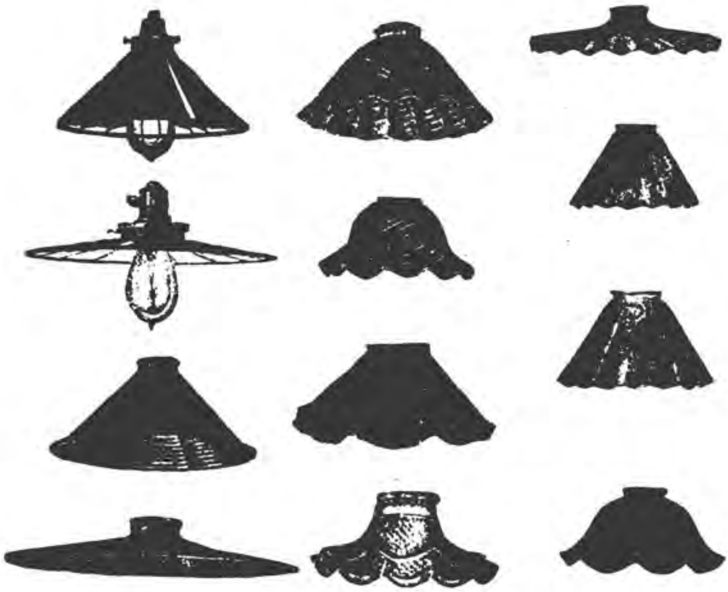


Fig. 1 (upper).—Reflectors of a decade ago.

Fig. 2 (lower).—Various forms of modern reflectors and globes. (Recent Developments in the Art of Illumination. By Preston S. Millar. Jour. Franklin Inst., October, 1914.)

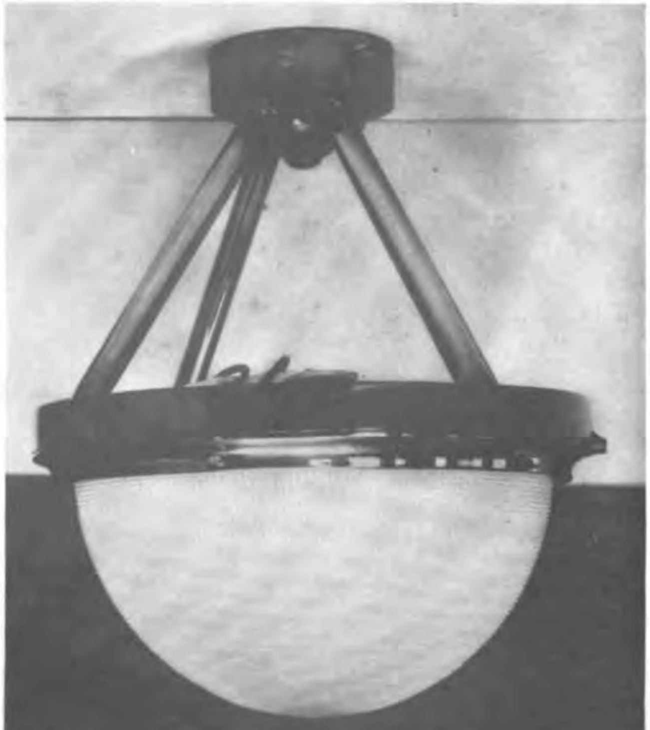


Fig. 3.—Semi-indirect ceiling fixture from wardroom mess room of the U. S. S. Arizona. (See page 291 and fig. 12.)

Fig. 4.—Stock fixture. Prismatic globe used in officers' quarters on almost all battleships. (See page 292 and fig. 13.)

Fig. 5.—Opal reflector, heavy density.

iolet radiation from ordinary illuminants has received much atten-
on and appears to have attained a physiological prominence which
quite undue; it will therefore be referred to in some detail, re-
rning for the moment to other aspects of the mercury-vapor lamp.
he obvious advantage possessed by this apparatus is its remarkably
v intrinsic brilliancy—10 or 12 candlepower per square inch—
hich puts it in a class by itself as compared with other electric-
ht sources used on shipboard. As the light from this lamp is
sibly monochromatic it is claimed that "visual acuity for ordi-
y reading and writing purposes is considerably enhanced," the
, of course, not being absolutely achromatic. On the other hand,
e is ample evidence to show that *long-continued* exposure results
decided color fatigue; from investigations by C. H. Williams[1]
ppeared that "this was slight at the junction of red and green,
yellowish and green lines of the mercury spectrum apparently
g the red and green sensations almost equally, and was chiefly
rved at the blue-green junction where the greater fatigue of the
n came into play. The fatigue is merely temporary * * *
was least noticeable in some of the cases who had worked
est under the light, as if the eye had acquired a certain immunity
he unusual stimulus." Under the actual conditions of use on
board even such temporary effects must be unusual, for I have
fully examined a number of men after various degrees of ex-
e to these lamps in the firerooms of the *Florida* with negative
s. It should be said, however, that in these compartments this
is somewhat modified by the presence of a number of carbon-
ent lamps.[2]

urious effects upon our visual apparatus resulting from faulty
nation, whether from natural or artificial sources, may be
ly divided into those comprised under the general, if somewhat
ite, heading of "eye strain," and those produced by the direct
of radiant energy upon one or more of the ocular tissues them-
Of these the former effects, while usually less obvious, are
greater practical concern to us on shipboard, though cases of
injury may and sometimes do occur. Examples of the latter
t infrequently seen in the case of searchlight operators, too
eing due, however, to needless exposure or sheer carelessness.
media of the eye differ in their response to radiation in accord-
th their respective transparency to waves of different lengths,
gical effects, when occurring, will depend in character and

---

ations on the Effect of the Light of the Mercury-Vapor Lamp on the Eye.
World, Sept. 2, 1911.

ly various attempts have been made to overcome the ghastly color effects of the
por lamp, the most interesting being the employment of a fluorescent shade
accordance with a general law, gives off longer secondary waves, extending into
and even the red. I do not know that it has ever been tried on shipboard.

degree, not only upon the intensity of the light to which the eye is exposed, but also upon the particular spectrum such radiation may happen to display. For example, the cornea is relatively opaque for the shortest—ultraviolet—waves, while the longest—heat waves—are mainly absorbed by the aqueous and vitreous, so that few if any waves beyond the visible spectrum ordinarily reach the retina.[1] While it is reasonable to suppose that injury of some sort may be produced by excessive radiation in any portion of the spectrum, it is generally assumed that such damage is most apt to occur under exposure to the extremely short ultra-violet, or abiotic, waves. Since all ordinary light sources, including the sun, produce these waves to some extent, the practical point for consideration at present is to determine whether or not any of the illuminants used on shipboard emit such radiation in dangerous degree. Incidentally it will be well for us to bear in mind that all our sources of luminescence are enclosed in *glass*, and as this substance is extremely opaque to waves in the ultra-violet very little energy is transmitted in this form. This statement applies to the ordinary mercury-vapor lamp, which, however, must not be confused with another type, not used on shipboard, in which the container is made of *quartz*, which is highly transparent to waves of short lengths. Lamps of the latter form are commonly used in photography, where strong actinic effects are desirable. They are much more efficient than those with the glass tube, the quartz permitting high internal temperatures which glass would not withstand. The quartz tube, however, may be itself inclosed in a glass container which cuts off the abiotic rays and renders the lamp available as an ordinary illuminant. Without attempting to summarize or paraphrase the opinions of various authorities on this subject, I shall quote freely from a paper written by two,[2] as their views seem to me sufficiently conclusive:

"One can not stigmatize an illuminant which emits ultra-violet as dangerous for this reason any more than one can declare a stove unfit for use because it is possible to burn the finger by deliberately touching it. * * * Broadly, we have found that no artificial source of light used for illuminating purposes contains enough ultra-violet radiation to involve the slightest danger to the eye from its effects under any readily conceivable conditions of use. * * * Abiotic action for living tissues is confined to wave-lengths shorter than 305 $\mu\,\mu$, at which length abiotic effects are evanescent, while for shorter wave-lengths they increase with considerable rapidity. * * * Experiments on rabbits, monkeys, and the human subject prove that the retina may be flooded for an hour or more with light

[1] As noted in a former paper, only rays which are *absorbed* produce material effects, whether these be chemical, thermal, physiological, or pathological.

[2] The Alleged Dangers to the Eye from Ultra-violet Radiation. F. H. Verhoeff and Louis Bell. Science, September 25, 1914.

extreme intensity (not less than 50,000 lux), without any sign permanent injury. The resulting scotoma disappears within a hours. * * * Infra-red rays have no specific action on the es analogous to that of abiotic rays. * * * Actual experiments e on the human eye show conclusively that no concentration of ation on the retina from any artificial illuminant is sufficient to uce injury thereto under any practical conditions. * * * Comial illuminants we find to be entirely free of danger under the nary conditions of their use." As limitations of space prevent a discussion of these questions it will be assumed in what follows on shipboard we are chiefly interested in the prevention of train and its attendant evils.

the practical consideration of any lighting system the color and ce of walls and ceilings are factors of great importance which d be given due weight. On shipboard these matters are deter- l by departmental order, the exact shade and surface quality h compartment being explicitly specified. Without going too into detail, it appears that the requirements for living spaces follows:

Pure white, gloss finish:
All offices.
Chief petty officers' staterooms, mess rooms, and quarters.
Crew's reception and reading room.
Pure white, flat finish:
Crew's quarters except as noted above.
Pale green, gloss finish:
Officers' quarters.
Sick bay.
Isolation ward.

green tint produced by exact compliance with the department's *ing Instructions, 1914*," is comparatively pale, though decided, ile it absorbs considerable light the amount so lost is probably of much consequence. There has been a tendency in the past, r, to use an excessive amount of coloring matter, particularly aint applied to officers' quarters, though I have seen the same n of affairs in at least one sick bay. The result in some cases render the compartments affected gloomy and depressing to a degree. Assuming, however, that paint is mixed and applied accordance with specifications, do the results adequately fulfill irements? While freely admitting that this and many simiions must be answered with reserve, I am strongly inclined to hat the evidence is unfavorable. In the first place, it will be from the table above that gloss is generally used in the very ments where reading, writing, and similar operations are mmonly conducted. No doubt this gives more light, but it also

gives *more glare*, due to regular (or specular) reflection. It does not appear to me that the gain in general illumination by any means compensates for this disadvantage, a disadvantage which is real and readily apparent. If gloss is used for reasons of cleanliness, it would seem most necessary in the crew's quarters, where so many persons congregate; but there the finish is flat, as it should be, in my opinion. Indeed, I am not greatly in favor of gloss in any part of the living spaces, unless it be for the sick quarters, where illumination may generally be regulated and spotless surfaces are particularly imperative. Furthermore, the distribution of color seems somewhat inconsistent from the hygienic point of view. Why should officers' mess rooms and staterooms be tinted, while similar compartments for the men are white? Would not the arguments for the former apply to both, and in even greater degree to the crew's reading room? Again, all offices are white, and glossy white at that, though in these compartments avoidance of glare is of special importance.

Finally, the question arises as to the color itself, since it can hardly be doubted that some tinting is advisable. While I am unable to give any very definite physical basis for the opinion—it may be based on purely psychological grounds—I would personally favor a very pale yellowish buff rather than our standard shade of green, and I may add that I have heard a good many officers on shipboard express a similar preference.

Summarizing these observations, then, I would tentatively suggest consideration of the following modifications in our painting scheme:

Pure white, gloss finish:
Not to be used.
Pure white, flat finish:
Crew's quarters, except as noted below.
Pale buff, gloss finish:
Sick bay.
Isolation ward.
Pale buff, flat finish:
All offices.
Officers' quarters.
Crew's reception and reading room.
Chief petty officer's staterooms, mess rooms, and quarters.

In many compartments considerable wall space is taken up by furniture, perhaps 50 per cent or more in some offices and staterooms. Of late such fittings are of metal heavily enameled in very dark olive green, resulting in much loss of light, heavy shadows and strong contrasts. As this seems a very unfavorable combination for the eyes, experiments might indicate the advantage of using some lighter shade. Moreover, the colors for our staterooms and mess rooms might well be chosen with due regard to their combination as a whole. It is true that esthetic considerations carry little weight on

board and one can grow accustomed to "golden" oak and pea-n walls, but when harmony and utility go hand in hand it seems ewhat unnecessary.

nce, as noted in a former paper, we must of necessity use direct ing almost exclusively, it is hardly worth while discussing all its ive merits and disadvantages, but it has one aspect which is of cular interest to us on shipboard. It appears that any excess of above a very low minimum is peculiarly objectionable with this m. According to Ferree (*loc. cit.*) with direct or semi-indirect ing at an intensity which gives maximal acuity of vision, as de-ned by the momentary judgment, the eye runs down rapidly in ncy. He found that "the most favorable intensity is secured by stallation that gave 1.16 foot-candles in the horizontal, 0.85 in 5° position, and 0.45 in the vertical. At this intensity, however, ss in efficiency of the eye for three hours of work was almost and one-half times as great as for a wide range of intensities ther the indirect system or daylight." This is far below even istomary standards on shore and would certainly not be will-tolerated on shipboard where the demand seems to be for a r illumination than theory and custom allow. It is therefore essing importance that we should determine just how far we go in meeting this demand, especially as there has already been lency to make concessions in this direction. For this and many questions we need *experimental data*, collected under service ions, data, moreover, which are not obtainable with the ordi-facilities afloat.

estimating the utility of our installations it is hardly fair to nn a system itself for defects arising from its improper use, may as well be said at once that the most casual investi- of conditions on shipboard will show misuse and abuse of that cry aloud for control and correction. Sometimes such ences are due to ignorance, occasionally to pure carelessness, often, perhaps, to a combination of both. For example, it is mmon occurrence to see some one operating a typewriter with tungsten lamp suspended immediately over the machine and y within the line of vision. Upon a recent occasion I observed reading and writing table for the crew, which had been to a white bulkhead, and before each seat, some 2 feet or ove the desk, hung a plain 40-watt lamp absolutely unshaded. g my present cruise an officer who had recently joined the ship ined of ocular discomfort, saying also that he had had no us difficulty of the kind. Upon investigation I found a bare tt lamp in the middle of his stateroom, located there by his essor, and further inquiry showed that several other rooms e same abominable equipment.

In approaching the subject of light distribution some limitation is obviously necessary, and the following discussion will be mainly restricted to a few typical compartments selected from the living spaces of officers and men. In offices and staterooms local conditions vary so much individually and from time to time that they can not be summed up as a whole. This is chiefly due to the fact that two classes of lamps are commonly employed in these compartments, some being permanently fixed while others are "portable," the location of the latter, for all practical purposes, being now left entirely to the discretion of the users. While the total number of portables is comparatively small their relative importance is really very great, not only because they are generally used for work which is trying to the eyes but also on account of the fact, as indicated above, that their great convenience leads readily to an aggravation of the very faults they are designed to correct. It does seem, however, that the two lamps—one fixed and one portable—officially allowed to each stateroom are not enough.[1] Certainly more are promptly requested, and sooner or later each room is pretty sure to acquire from one to three additional lamps, perhaps of 40 watts each rather than 25. To some extent this is merely a matter of convenience; it is easier, for instance, to turn on a new lamp above one's pillow than to get up and remove a single portable from the desk, and under such circumstances all the light available may not be used at once. Similar conditions commonly prevail in offices, which are apt to have two or three times as much light as the designs call for.

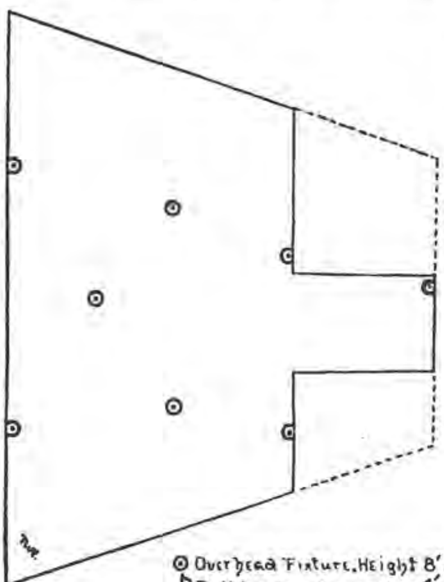


FIG. 6.—Berth deck of U. S. S. *Maine*.

In figure 6 is shown, diagrammatically, the lighting layout of a compartment on the berth deck of the *Maine*, which is much used by the crew as a "living room." Its area is approximately 1,056

[1] Since this paragraph went to print I have learned that the allowance is to be increased on the *California* class of ships, as follows:

One 60-watt ceiling fixture.

One 25-watt desk light near berth.

One 25-watt desk light inside secretary.

One 25-watt desk light over toilet-case mirror.

square feet, and it was originally illuminated by eight 16-candlepower lamps (or rather less than 1 candlepower to 8 square feet), but these lamps have very recently been replaced by 40-watt tungstens, giving twice as much light on four-fifths the power. Even so, the impression upon entering this compartment is decidedly gloomy; dark shadows throw the lamps themselves into bold relief, and each of these lamps is *bare*, with clear glass bulb. Of the eight lamps, three only are overhead, and these are partly hidden between the beams; the other five are mounted vertically against the bulkheads at heights of 4 to 5 feet, a most uneconomical arrangement and one which is particularly objectionable as bringing the light below the eyes.

It needs little argument, I think, to show that in this case the original layout was bad and that doubling the amount of light

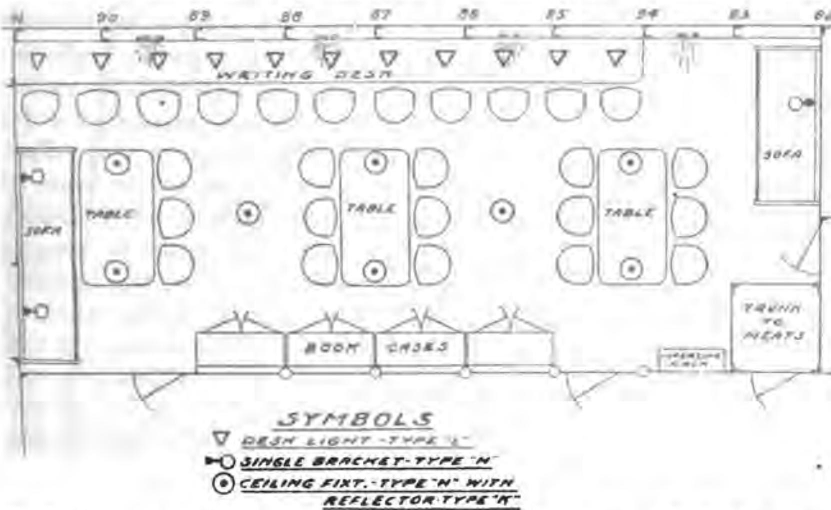


FIG. 7.—Arrangement of lighting fixtures in crew's reading room on U. S. S. *Arizona*. (See p. 288.)

has not greatly improved matters. Under the peculiar conditions of wall space, ceilings, etc., probably 1 candlepower to 2 square feet—four times the original—would not seem excessive.[1] There is too much light entering the eye from below, and extreme contrasts are admirably suited to promote glare. The bare lamps used originally were bad enough, and they are now much worse. Broadly speaking, I should say that this compartment needs many more lights, relatively much less light from below, overhead lamps clear of the beams where practicable, and a *suitable shade on every bulb*, all conditions which are readily obtainable.

[1] It must be understood that this and similar expressions are merely rough approximations. In my opinion the optimum illumination for conditions on shipboard is still largely a matter of conjecture.

Passing over the meager developments of some 17 years let us contrast with the above the design shown in fig. 7. Here we have a long step in advance, one of the crew's compartments being set aside as a reading and writing room with a lighting equipment specially designed, in part at least, to promote these purposes. The fixtures are all of new types. The eight which are overhead are to be fitted with reflectors of prismatic type and seem well located with regard to the reading tables. The new bracket fixture (fig. 8) seems a vast improvement over the corresponding type so long in use; the lamp hangs vertically, and the shade is long enough to extend well below the bulb, so that a bare filament, if used, would be practically withdrawn from over the field of vision (*i. e.*, it would only be seen by glancing directly overhead).

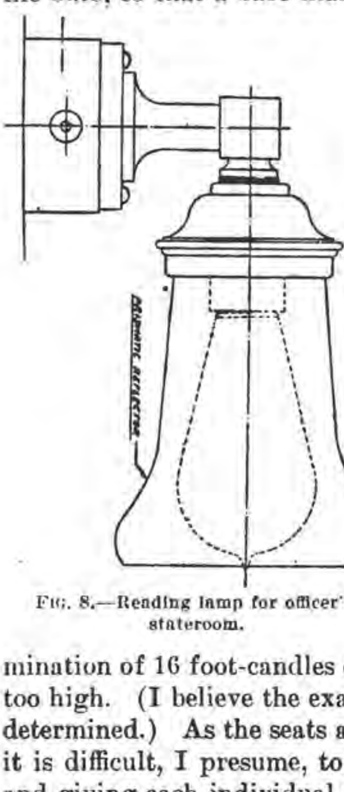


FIG. 8.—Reading lamp for officer's stateroom.

The desk lamps are to be mounted horizontally in opaque reflectors which may be adjusted to various angles; for reasons already noted it might be safer to have them fixed, and proper relation of the seats (if movable) should be clearly indicated. While I do not wish to trespass within the province of the technical expert, particularly in the case of an installation which has not yet been tried out, I must confess that this part of the design seems a bit disappointing. We may expect 40-watt lamps to be used in these fixtures (although 25-watt lamps are to be specified), giving, perhaps, an illumination of 16 foot-candles or more on the desk, which seems entirely too high. (I believe the exact height of these fixtures has not yet been determined.) As the seats are all on one side and very close together it is difficult, I presume, to obtain an arrangement free from glare and giving each individual light from the left side. Perhaps under somewhat different conditions, *i. e.*, with the desk away from the wall, semi-indirect fixtures might have been employed with advantage, but limitations of space leave little or no choice in this matter.

Figure 9 indicates the location of lights in the wardroom of the *Maine*, five single lamps in prismatic globes between beams and two clusters of four lights each over the tables. The problem of distribution in this case is comparatively simple, and in this respect the

effects are good. The original equipment gave about 1 candlepower to 2.2 square feet, but this has now been doubled, and it would be difficult to convince a member of the mess that he could get along with less, although the illumination on the tables probably exceeds 7 foot-candles. The particular point of interest in this old design is the 4-lamp fixture, a type which I believe has been installed on every ship since constructed in spite of manifest disadvantages, though it must be admitted that the more objectionable features are not inherent but due to improper use. These lamps hang at an angle of 45° below the horizontal and each is fitted with a wide-mouthed

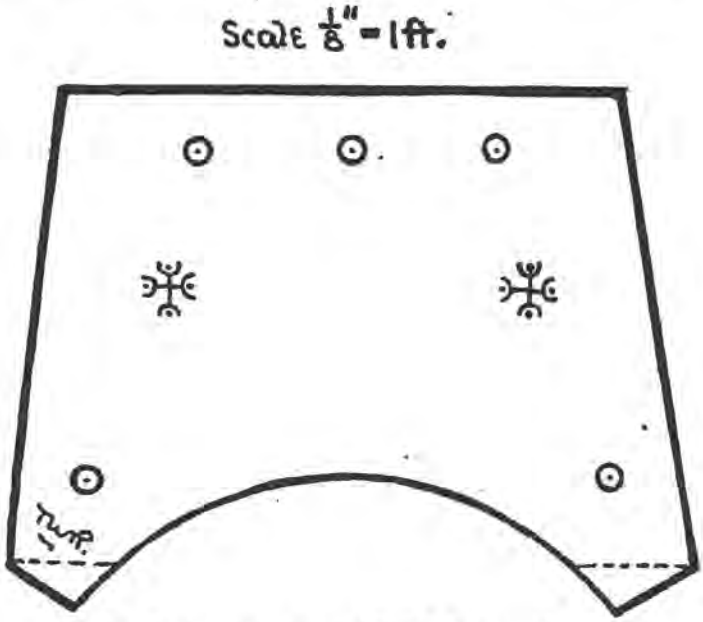


FIG. 9.—Wardroom mess room of U. S. S. *Maine*. (See p. 288.)

porcelain shade, which is considerably shorter than the bulb. Now, it was no doubt intended that frosted bulbs (or bulbs with frosted tips) should be used in these fixtures, but as a matter of fact *clear* bulbs are almost universally employed. The result is that the eye continually encounters the brilliant filaments, for a little experiment will show that for each cluster three bulbs are more or less visible from any one of four angles, while there is no position which conceals more than two. Similar conditions prevailed in the wardroom of so late a ship as the *Florida* for example (fig. 10). Here we have not only the two overhead fixtures, but the situation is aggravated by six double brackets, each of which carries a pair of lamps mounted on the same principle. These side lights are worse,

however, as they are considerably lower, and the net result is that one can neither stand nor sit in the *Florida's* wardroom without having the eye dazzled by brilliant images. Of course the remedy is

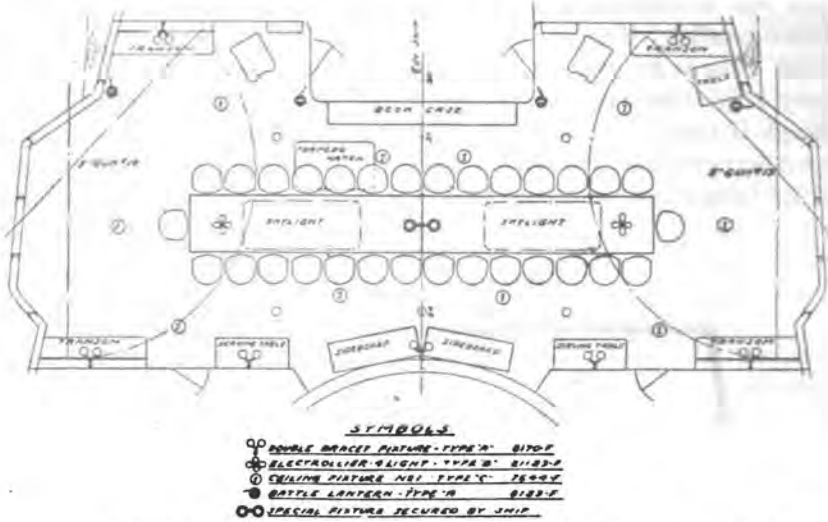


FIG. 10.—Arrangement of lighting fixtures in wardroom of U. S. S. *Florida*. (See p. 289.)

obvious enough, but even if the medical officer calls attention thereto he is apt to meet little sympathy or encouragement owing to a very general laçk of intelligent interest in such matters. And yet I do

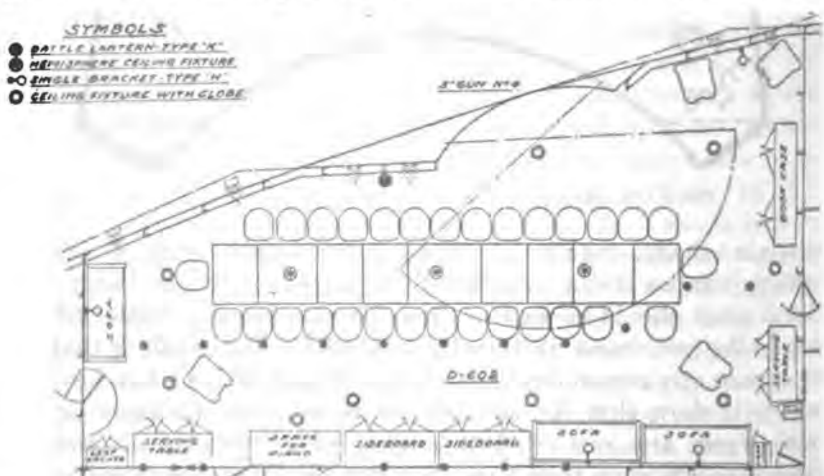


FIG. 11.—Arrangement of lighting fixtures in wardroom of U. S. S. *Arizona*. (See p. 291.)

not remember ever having been aboard a passenger steamer, even on a one-night run, where exposed bulbs were not universally frosted.

The *Florida's* wardroom is probably too brilliantly lighted, as ference to the diagram will show, but the illumination was *rela-ely* somewhat weak over the middle of the table. As usual, more ht was demanded, and this was eventually supplied by two special tures, containing four lamps, which were purchased by the mess considerable expense.

The design for the *Arizona's* wardroom mess room (fig. 11) in-duces a new element which may have a decided influence upon

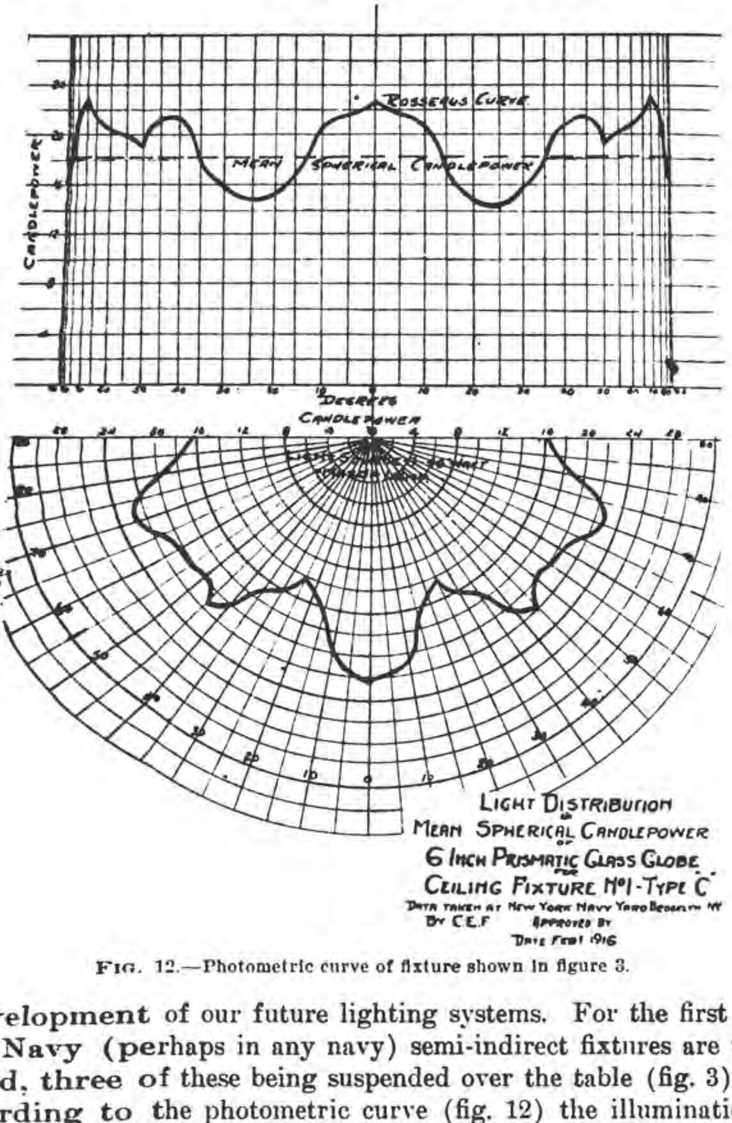


FIG. 12.—Photometric curve of fixture shown in figure 3.

velopment of our future lighting systems. For the first time Navy (perhaps in any navy) semi-indirect fixtures are to be d, three of these being suspended over the table (fig. 3). rding to the photometric curve (fig. 12) the illumination is ably uniform as far out as 70° and should give about 3.8 ndles on the table. The data for this curve, however, were

taken in a large room with very high ceiling,[1] conditions quite unlike those on shipboard, and it will be a matter of interest to contrast its performance between the beams of a compartment having only 8 feet of headroom. I mention this as another example which emphasizes the importance of obtaining more data on shipboard.

The ceiling fixture is, I believe, of the standard type so long in use (figs. 4 and 13), but the brackets are new, like the ones already

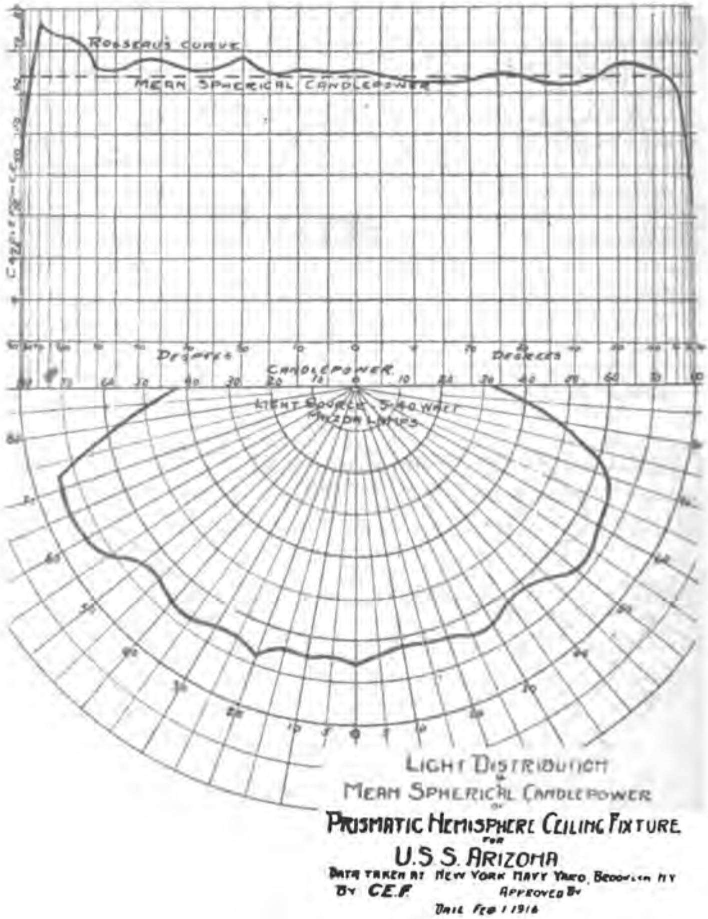


FIG. 13.—Photometric curve of fixture shown in figure 4.

referred to in the crew's reading room. The total amount of light (about 1 candlepower to 3.5 square feet) is considerably less than that of the *Florida* (assuming that 40-watt lamps are used in both cases), but with the distribution indicated it ought to be ample.

[1] Semi-indirect lighting links the direct and indirect systems, and in any particular case may approach one or the other of these as an extreme. Under the conditions here referred to it would seem that what the curve really shows is mainly the distribution of light transmitted through the bowl, *i. e.*, direct lighting. The total illumination on the table will probably not be less than 5 foot-candles.

From this brief comparison of several designs, prepared at various periods, it would appear that during a number of years (15 at least) there was no very marked development in the art of illumination as applied on shipboard, except a simple substitution of the high-power lamp. As this was done without any compensating modification of the old fixtures, with a view to protecting our eyes against the increased brilliancy, the change has not been an unqualified improvement. Of late, however, there has been renewed activity on the part of our technical experts indicating a better appreciation of existing conditions afloat. If this new movement is to continue and attain logical results it is evident that, as medical officers, we must be prepared to take an active and intelligent interest in the process.

In conclusion, I wish to express my sincere thanks to Lieut. Commander E. P. Jessop, United States Navy, and to Mr. William Hetherington, jr., electrical expert aid, Navy Yard, New York, for indispensable data and the drawings (figs. 7, 8, 10, and 11), which were specially made for this purpose.

SUMMARY AND RECOMMENDATIONS.

1. There seems to be a general demand on shipboard for a somewhat higher general illumination than that called for by theory and practice ashore. This may be due in part to excessive exposure to bright sunlight and glare on deck.

2. With modern lamps there is generally power enough available to furnish an adequate amount of light, with allowance for loss by proper shading.

3. The system in use—direct lighting—is the only one generally practicable at present.

4. With this system care in securing proper distribution and diffusion of light is particularly important. On shipboard this matter is urgent, because local conditions make for heavy shadows and strong contrasts, while confined quarters and low ceilings bring light sources close to the eye.

5. The exposure of bare metallic filaments of high intrinsic brilliancy is now the general custom and is much to be deprecated. Steps should be taken without delay to prevent the indiscriminate use of bare lamps in living spaces, suitable shades (or frosted bulbs) being made obligatory.

6. There is much misuse of light, particularly in staterooms and offices where portables are installed.

7. Officers and men of certain ratings should be instructed in simple rules of good lighting, and medical officers should inspect and

advise more generally in these matters. Such instruction might advantageously be given at schools for yeoman and electricians.

8. Certain changes in interior painting seem indicated.

9. The problem of good lighting can not be solved by random observations, and the importance of the subject warrants investigation by a specially selected board. Such a board should be given every facility and a free hand to conduct experiments on some ship in reserve.

This recommendation, first suggested and advocated by Medical Director J. D. Gatewood, United States Navy, should appeal to everyone who has seriously considered the question of illumination on shipboard and appreciates its peculiar difficulties.

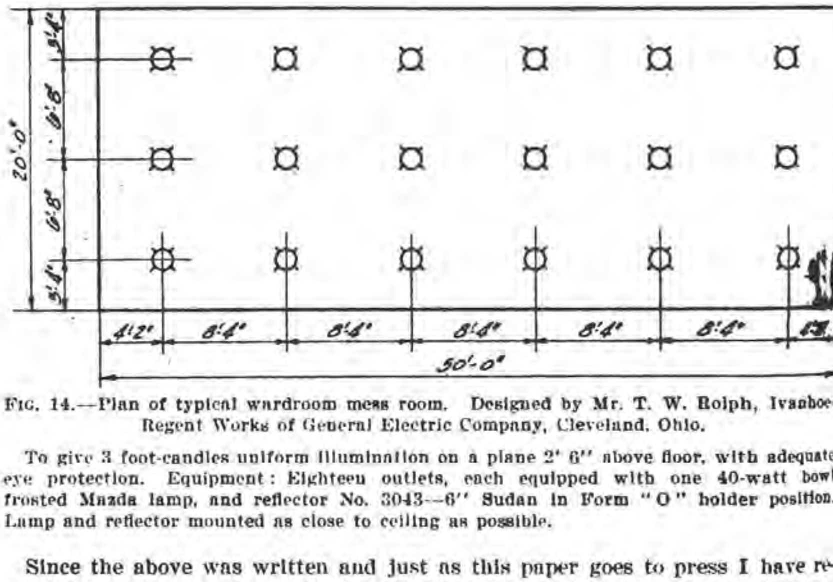


FIG. 14.—Plan of typical wardroom mess room. Designed by Mr. T. W. Rolph, Ivanhoe Regent Works of General Electric Company, Cleveland, Ohio.

To give 3 foot-candles uniform illumination on a plane 2' 6" above floor, with adequate eye protection. Equipment: Eighteen outlets, each equipped with one 40-watt bowl frosted Mazda lamp, and reflector No. 3043—6" Sudan in Form "O" holder position. Lamp and reflector mounted as close to ceiling as possible.

Since the above was written and just as this paper goes to press I have received the following data from Mr. T. W. Rolph, the well-known illuminating engineer, and his generous response to my request for information is greatly appreciated. As will be seen, his design for a wardroom (fig. 14) differs considerably from any in actual use, and this opportunity to compare current commercial practice with our own should prove of great value. Of course, our mess rooms are not always so symmetrical, and many of our lights are located with special regard to furniture (sofas, side tables, etc.), but I purposely omitted such details, merely specifying shape and size of mess room and the customary overhead beams.

There are several features of this design which seem to me of particular interest:

(a) The total amount of light is very considerable, namely 1 candlepower to 1.7 square feet of floor space, or relatively just twice as much as we are to have in the wardroom of the *Arizona*.

(b) Particular care is taken to cut down brilliancy of light sources, secure good diffusion, and safeguard the eyes.

(c) The illumination is uniform on the working plane (3 foot-candles). As was to be expected, this is less than we are now accustomed to on the mess table.

(d) Color scheme for walls and ceiling differs considerably from current practice on shipboard.

These questions are fully discussed by the designer, as follows:

"In treating your request of a typical wardroom * * * it seems best to consider this without regard to present practice, disregarding to a certain extent mechanical obstructions, such as beams, skylight, etc. The lighting of a room of this character, which is large, yet has a low ceiling—8 feet—is difficult, especially when the room is used for social purposes. The difficulty is due to the fact that light sources can not be mounted high, and necessarily come within the range of ordinary vision. This means that the light sources should have a low intrinsic brilliancy, in fact, lower than is ordinarily obtained with direct lighting units. If open reflectors are used, there is the question of contrast between the interior and the exterior of the reflector. This contrast in brightness is too great if the reflector is extremely dense. We can not resort to inclosed units, as the units of this type on the market are too bright to be placed so close to the line of vision as a general rule. * * * Nevertheless it is possible to obtain reasonably good results at present by using open reflectors of fairly low transmission qualities. * * * Some might classify the Sudan as medium density, as it is not as heavy as some reflectors on the market. Density is, of course, understood here to be degree of reflecting efficiency and inversely, degree of light transmission.

We have laid out a system of lighting for this room, using the method of figuring covered in section 3 of the Lighting Handbook.[1] We recommend that the ceiling be painted white or a light color in order to get good diffusion of illumination by means of reflection from the ceiling. We would recommend the walls a medium color. We believe that if the walls are too light, there is too high a brilliancy of surroundings and background, while if the walls are too dark there is unpleasant contrast between the brightly lighted objects in the room and the dark background. The following are the data on which the figuring is based:

Room, 20 feet by 50 feet.

Foot-candles desired, 3.

Direct lighting to be used, with Sudan reflectors.

Ceiling light, walls medium.

Constant, 0.45.

With the above data, the calculation of total lumens[2] required from the lamps is—

$$\text{Total lumens} = \frac{\text{area} \times \text{foot-candles}}{\text{constant}}$$

$$= \frac{20 \times 50 \times 3}{45}$$

$$= 6667$$

[1] The Lighting Handbook. Ivanhoe-Regent Works of General Electric Co., Cleveland, Ohio. This little booklet contains a great amount of general information upon the theory and practice of electrical illumination, and it is written in plain language

[2] The lumen is a unit which is becoming more and more generally used in illuminating engineering. According to the Lighting Handbook, "one lumen of light is the quantity necessary to produce one foot-candle average intensity of illumination on an area of one square foot." The lux is a unit little used in this country. It indicates an illumination of one lumen per square meter. (T. W. R.)

We tried 60-watt lamps, which give 590 lumens, and the number of lamps required comes out 12, which means two rows of 6 lamps each. This requires lamps 10 feet apart, and with this type of reflector the illumination will drop off somewhat between lamps. Ordinarily this would not be serious, but in this case the dining table in the center of the room would be the point where illumination drops off. We might put the two rows closer together than 10 feet and allow the illumination to drop off at the sides of the room, but it seems better to use smaller lamps and a greater number. We therefore tried 40-watt lamps, which give 380 lumens, * * * and this comes out 17.6 or 18 lamps required. This means three rows of 6 lamps each, lamps placed on squares 6 feet 8 inches by 8 feet 4 inches. * * * Of course, this seems like a large number of lamps to use, but with the low ceiling and the size of the room it is scarcely possible to obtain uniform illumination with wider spacings without directing considerable light into the eyes of the occupants of the room at certain angles of ordinary vision. * * *

The system recommended will give a uniform illumination of 3 foot-candles throughout the entire room."

FUMIGATION OF THE U. S. S. TENNESSEE BY THE CYANID METHOD.

By N. ROBERTS, Surgeon, United States Public Health Service, and G. E. ROBERTSON, Passed Assistant Surgeon, and A. E. BEDDOE, Assistant Surgeon, United States Navy.

The following description of the "cyanid method" of ship fumigation as it was conducted on the U. S. S. *Tennessee* is offered for consideration because it is believed to be by far the simplest, the quickest, and the most efficient of the various methods that have been employed to rid ships of vermin. We believe that this method has never been used on an American warship before though it has been used in fumigating merchantmen.

The U. S. S. *Tennessee* was fumigated at the Navy Yard, Philadelphia, Pa., in September, 1915, to rid her of rats, cockroaches, and bedbugs. The work was done by the personnel of the ship, directed by the medical officers, under the supervision of a medical officer of the Public Health Service, who had had experience with the cyanid fumigation of merchant ships.

Many of the ships of the Navy after they have been in commission for a few years are infested with rodents and insects, which can not be gotten rid of except by some method of extermination that will become effective in all parts of the ship at the same time, and one that does not necessitate the removal of any of her contents. It is evident that it would be useless to fumigate a ship piecemeal and expect any real results. It is also equally evident that it would be very ineffective to fumigate with a gas that would damage certain articles to such an extent that they would have to be removed from the ship during the process. In the first case the pests would simply migrate from one compartment to another, and in the second case they would be carried off the ship in the articles that would be removed, and then carried back.

Iydrocyanic acid gas, mixed with the internal atmosphere of the) in the proper proportions, will quickly and certainly kill all air- ithing animals exposed; it will penetrate into the interior of por- bodies, such as mattresses, hammocks, and bags, in a short time; and longer time into closed drawers, trunks, and other containers of tight material having pervious joints and cracks. If those en- d in the work are properly equipped and are supervised with onable skill and care, there is practically no danger. The gas is ically and chemically inert, and does no damage to structures, inery, stores, or personal effects (although a small quantity of spray is thrown off, which may cause a slight tarnishing of bare l near the generator), and there is no danger of fire.

e process is essentially very simple; a quantity of solid sodium d is dropped into a bucket containing a mixture of sulphuric ind water, the operator at once escapes, tightly closes the com- ient behind him, and leaves the gas to generate, diffuse, and rate for from 1 to 48 hours, according to circumstances, after the compartment is opened and thoroughly ventilated, prefer- y blowers; all of which, except the planning necessitated by itricate construction of modern warships, requires little time ill, and not very much labor.

material required for fumigating the *Tennessee* was as fol- 750 pounds of sodium cyanid (this was in egg-shaped lumps ing exactly 1 ounce each), 1,000 pounds of sulphuric acid, 400 gallon cedar buckets, 25 pounds of paraffin, 50 pounds of wash- da, 400 two-pound paper bags, about 800 tags, and 2 large s. The material was used in the following proportions: For 00 cubic feet of space, 1 ounce of sodium cyanid was mixed ½ fluid ounces of sulphuric acid and 2 ounces of water.

the aid of the carpenter every compartment in the ship was ed and the cubic space estimated, except the double bottoms magazines. It was considered that these compartments were lly closed off from the ship proper and not infested. At this was determined where and how many buckets should be placed compartment. In general, it was planned to have one bucket re of 3,000 cubic feet of space, but sometimes it was necessary ase or diminish the amount of cyanid and acid used in a cer- npartment because of the size of that compartment.

ship was carefully gone over and the position of each gen- as decided. The doors, hatches, etc., to be left open or closed nce were determined. At this time the route to be followed party charged with the potentially dangerous task of drop- cyanid into the acid and closing the compartments, or sev- ups of compartments, after them was determined. Planning

this route was the most difficult part of the fumigation, insomuch as the party had to go into every part of the ship, start the generators, escape, and shut the entrance behind them, without at any time passing through any space already containing gas. It was necessary to have an easy entrance to each compartment, and to have an easy and efficient means of closing off after starting the cyanid so as not to endanger life. This made it necessary to divide the ship off into odd-shaped groups of compartments connected by a long and intricate route.

While this planning was being done, the fires were drawn, the machinery allowed to cool, the ventilating system stopped, and the yard current connected up. Arrangements had been made to transfer the entire ship's complement to another ship in the yard while the actual fumigating was going on. All hatches, ventilators, uptakes, funnels, and in fact every external opening was either sealed or battened down.

Nothing was allowed to be removed from the ship except the necessary wearing apparel for the crew during their absence from the ship. Everything inside the ship was opened as much as possible, bags and hammocks put about the decks below, and all drawers, trunks, etc., in the officers' quarters were opened.

The cedar buckets were paraffined to prevent their destruction by the acid. The acid was mixed with water in two large barrels on the forecastle. The required amount of water was put into the barrels and then the acid was slowly added, the mixture being constantly stirred in the meanwhile. It is quite necessary to use considerable care in pouring the acid out of the carboys to prevent splashing, especially when the carboys are full. It was during this operation that washing soda was necessary. The soda was strewed about the decks to neutralize any spilled acid. A solution was kept for washing the hands whenever any acid got on them. When the acid was mixed the paraffined cedar buckets were filled with the required amount, which was usually two or three quarts. Each bucket was tagged to show the amount of acid it was to contain in quarts and its destination. The buckets were distributed as filled. Tags had been made out for the cyanid, telling the number of the compartments and the amount of cyanid in ounces. At the same time the acid was being mixed and distributed, bags were being filled with the required amount of cyanid, tagged and distributed. Each bag of cyanid was placed beside the designated bucket of acid. It was very gratifying to the officers in charge that the men distributing the cyanid did not drop any into the acid during the distribution.

After the ship had been prepared (hatches closed, acid and cyanid placed, etc.) it was carefully inspected to see that each bucket of acid, accompanied by the proper charge of cyanid, was in the right

ce; that the proper doors or hatches were opened or closed, as per edule; and that there was a free escape.

The operators consisted of three qualified respirator men, wearing not using oxygen respirators. They were to use the respirators in case they became trapped in the cyanid fumes. The respira- were as a "safety-first" measure, and while it was not neces- to use the apparatus, and we believe that it is entirely feasible do the work without any protection, it adds a measure of protec- that is exceedingly comforting to those in charge of the work.

ust before the acid was generated the operators made a complete uit of the route to be followed to entirely familiarize themselves it, to see just where each bucket and bag was located, that y person was off of the ship, and to correct any possible errors. rything having been found satisfactory, the operators made the round. All that was done on this trip was to drop the cyanid the acid and close the water-tight doors. The cyanid was not ied into the acid, but the bag containing the cyanid was placed e acid. This plan slightly delayed the formation of the gas, and fore added a measure of safety. The time of the final trip was le less than one hour. The yard current was now shut off, and hip was allowed to remain closed for fourteen hours.

ygen respirators were used in opening the ship. They were more important for this work than in starting the fumigation, se it is necessary to reach the blower switch and start the ven- ng system. The crew was not allowed on board until 18 hours the ship was opened. It is thought that not more than 4 to 6 need elapse before a ship is free from cyanid fumes to the that it would not be dangerous to human life.

ship was fumigated to rid her of rats, cockroaches, and bed- Now, after three months, the ship has no rats, few cock- s, and it is believed no bedbugs. We have every reason to the result is as nearly 100 per cent perfect as it is possible to

advantages of the above method of fumigation over other ls, especially sulphur dioxid, are as follows:

he gas is harmless to material of all kinds, thus making it ssary to remove anything from the ship.

penetrates easily into any but air-tight containers, making cessary to spread out bedding and clothing.

here is no danger from fire.

here is no lingering odor in compartments or clothes.

used properly, it is nearly 100 per cent efficient against animal
ince the U. S. S. *Tennessee* was fumigated, investigations by of the Public Health Service, have been reported, showing uch smaller amounts of cyanid may be used with equal effi-

ciency (approximately 100 per cent in each case) and with the advantages of (a) lower cost, (b) less labor, and (c) less danger to those engaged. The most recent figures (liable to be reduced still further) are 3¾ ounces of sodium cyanid per 1,000 cubic feet, with 5¼ fluid ounces (10 ounces by weight) of sulphuric acid and 7½ ounces (or fluid ounces) of water. An ordinary bucket of 3 gallons capacity will serve as a generator for about 10,000 cubic feet of space. It has been discovered that in cold weather the reaction is very slow or may not start at all, unless the mixture of acid and water is *warm* when the cyanid is dropped in. Fortunately the introduction of the acid into the water produces a great deal of heat, which is sufficient to start the reaction if the dilute acid is at once put into the generator and the cyanid added within a reasonable time. Furthermore, fumigation against insects especially should, whenever possible, be done in warm weather, inasmuch as when cold insects are torpid and their respiration and circulation sluggish, and hence a considerable number may survive the fumigation that would be otherwise 100 per cent efficient. The weather was very warm at the time the *Tennessee* was fumigated.

THE NEW HOSPITAL CORPS FORMS.

By W. E. Eaton, Passed Assistant Surgeon, United States Navy.

Certain radical changes have recently been made in the forms which concern hospital corpsmen, with a view to raising the present standards and thereby promoting efficiency. Certain information desired by the bureau relative to the qualifications of men of the corps either upon enlistment or upon promotion later, or with regard to making details to special duty has not been available heretofore and the following changes have therefore been considered expedient:

The navigation form, N. Nav. 238, "Efficiency Report, Hospital Corps, United States Navy." The old form was more or less confusing by its alternating spaces for offenses and duties and remarks. Many of the special duties concerning which it was frequently necessary to know the ability of men in order to assign them to important details (to comply with requests of medical officers for an anesthetist, a laboratory or a commissary man) did not appear. These requests for men specially qualified went unanswered, as no record had been kept. To be sure, a certain amount of information came in, but for the most part medical officers neglected to indicate the special ability of each man.

It is desired, therefore, that this new form be obtained as soon as possible by all ships and forwarded hereafter in all cases in order that information may begin accumulating without further delay.

Medical officers are requested to use the utmost care in awarding marks and in filling out the blank spaces, as upon this information will be based much of future satisfactory and unsatisfactory service. Such duties as can not be indicated by a figure should be commented upon in such a way as to convey a definite value of the ability or knowledge. A great variance in the awarding of marks by medical officers has been noted. A man should not be given a mark of 5 (or a high mark) merely because he is of long service or has always received 5; this would defeat the object of the report. Frequently a man is complained against as inefficient, etc., yet on consulting the efficiency report in his case a perfect mark of 5 is found awarded throughout. Recently a medical officer reported a hospital steward as worthless and unable to perform any duty wherever assigned. His criticism was most derogatory to the man, yet upon looking over the efficiency report in the case this same officer had seen fit to award a perfect mark of 5 in all duties—contradiction of his adverse verbal report. How, therefore, can such reports be depended upon? The marks, therefore, should be such as ability warrants.

These forms are all filed in the jacket of the man and referred to from time to time in connection with his duties. By means of this form the bureau is able to inform medical officers upon the special qualifications of the men under their command. These forms are the only means available to the bureau from which to obtain the information. It is urgently requested that greater care be taken in awarding marks and statements, and that this form be sent in with greater care and attention than is now the case; frequently, particularly when men are discharged from the service for any reason, the form does not come in at all.

In conjunction with this form a card index has been started under the various headings, as "X-ray," "Laboratory," "Anesthesias," etc., and a card with the name of each man qualified placed in suitable sections. By reference to this it is hoped that the detail desk may render a better service than heretofore. Cooperation by the officers in the field, however, must be expected and required.

New form "Statement of Qualifications for Hospital Steward." This is a new form and should be obtained from the Supply Depot and forwarded in the case of all men taking the examination for the rating of hospital steward, acting or permanent appointment. It was devised to take the place of the former perfunctory letter submitted by the medical officer under whom the candidate was serving or had served. It consists of a form letter presenting 10 questions. There is sufficient space between each question for the medical officer to put in the answer. On the back of the sheet is a copy of the efficiency report which should also be filled, in order to make the record complete.

By means of this form it is possible to gain a picture of the candidate and thus judge more satisfactorily all sides influencing the advisability of his appointment.

Recently one of the old-type letters came in, recommending a man highly for hospital steward. One of the new form statements of qualifications was sent to the medical officer in question and upon its return an entirely different picture of the man was given and a great weight of evidence introduced against his being rated hospital steward, and in entire opposition to the previous letter submitted. Needless to say, the man was not qualified and therefore not rated.

In the past many unsatisfactory and unqualified men have been given this important rating because of a lack of means to show them incompetent and undesirable.

The new "Examination Report, Hospital Corps." A certain amount of and an examination in general education is required of the candidate before enlistment in the corps. Preliminary training is therefore essential and of great advantage to the applicant. Of what has this preliminary training consisted, and how far has he advanced?

The new examination form has been devised in order to more completely determine the educational qualifications and preliminary training of our men. This information is also desired in view of the possibility of our obtaining the intermediate ratings and in connection with subsequent advancement thus afforded of only those men who are known to be well qualified. It is desirable to know how much common schooling he has had, and if he has had any, how much, and what kind of professional experience in civil life. This will have some bearing on his future advancement and on the judging of the advisability of his detail to certain duties, etc.

Under the heading "Preliminary education and training," it is desired that the years or portions of years be specified which the candidate has spent at grammar-school, high-school, academy, or other preparatory schools; whether he has attended lectures or a course in nursing at a civil, insane, or general hospital, or practiced nursing in civil life; the years of study or work given to pharmacy in drugstore or college; assistant to dentist or dental school or attendance at a medical school; and, lastly, any training in any other work having or not having a bearing upon or relative to hospital corps work. In short, a brief statement which gives a résumé of the man's education and previous training or experiences should be made.

The professional examination has been somewhat altered and enlarged to develop the men and their work and also provide for an examination standard for all ratings should the new intermediate rates be granted us.

Examinations will be held as heretofore and the papers in the case hospital apprentice, first class, for hospital steward, forwarded he bureau for correction.

nder minor surgery it is desired to group all matter and ques- s of a surgical character; the various emergencies; the proper luct of surgical technic, preparation for operation both as to plies and appliances of patient and operator; the proper con- ion of minor surgical procedures within the duty of a hospital sman; attendance upon larger operations in the operating room the surgeon; the care of and conduct within the operating 1, etc.

irsing and materia medica have been combined. This subject important one, and inconsequential questions should not be ted. Only questions dealing purely with actual nursing and dance upon and proper administration of medicines to the sick d be asked in such a way as to bring out fully the knowledge experience of the candidate. Now and then an examination is itted in which the questions are of such a character as to make aper valueless.

armacy and chemistry have been combined, as they should be. isive questioning of an advanced nature should not be made, ther the elementary and necessary knowledge within the actual ew of the rating should be determined.

ts and messing for the sick is a most important subject and has een neglected. I know of no more difficult and unsatisfactory ion than the helter-skelter, always doubtful, character of the feeding of those on board ship who are at all ill with condi- which require careful dieting. This field is one to be devel- f we can hope for better care of the sick and a lowered number days. Medical officers are urged to devote their attention to orm of instruction on the subject.

-bay and ward management and care of property is another eglected duty, open to doubt and irregularity. The hospital d at least must have an idea of systematizing and regulating ivities of his ward (sick bay). He must know how to care for erooms, stow properly his stores, and keep track of their ex- ires. He must have an idea of properly safeguarding his , in addition to knowing how the various forms should be ut.

r practical work there should be submitted evidence of what didate was required to do—a list of the procedures under- with the result, such as, "Asked to make an emulsion. Result, tory, etc." A specimen of and a statement as to proficiency writing should always be submitted.

Greater attention also is requested in notifying the bureau by means of the post card relative to transfers, changes, etc., of hospital corpsmen. These cards are of the greatest assistance in keeping track of details, the existence of vacancies, and the need of a station for men. The apparent neglect to forward them occurs principally in the cases of reenlistment, extension of enlistment, and changes in details on the Asiatic Station.

THE DIAGNOSIS OF SYPHILIS BY THE WASSERMANN REACTION.

By A. H. ALLEN, Passed Assistant Surgeon, United States Navy.

The basis of this article is the report of Drs. Uhle and MacKinney, of Philadelphia, Pa., on the Wassermann reaction in the Journal of the American Medical Association of September 4, 1915. Their thorough and extended work renders their report authoritative in the highest degree. They say, "Our experience has taught us that a Wassermann test made by a competent serologist is of great value, especially is this so when two or more serologists agree in their reports. * * * The Wassermann test is of only relative value and should be considered with a careful history and study of the case. Under no circumstances should a diagnosis of syphilis be based on the result of the Wassermann reaction alone." Their report is based on an analysis of 325 specimens of blood collected from 292 individuals and submitted to at least 4 serologists. Of the 292 individual cases, 25 were normal healthy individuals, 70 were suffering from disease other than syphilis, and 197 were syphilitics in various stages of the disease. Of the 25 normal persons, 27 tests being made, all the serologists agreed in a negative report in 21 tests and disagreed in 6. Of the 70 patients suffering from disease other than syphilis and presenting no symptoms of syphilis 56 were reported negative and one or more laboratories reported positive in the remaining 14 cases. In 36 known cases of syphilis, 40 examinations being made, all laboratories agreed in positives in 25 tests; in 15 they disagreed.

In 41 series of tests made on patients with various syphilitic eye or nervous lesions there were 28 disagreements; 128 examinations were made on 88 patients who had syphilis but presented no clinical lesions. "The reports from the laboratories were so inconsistent and the reports from the same laboratory varied so extremely in cases of repeated examinations that an analysis is practically impossible. * * * Analyzing the reports we find that all the laboratories agreed in 21 per cent, they disagreed materially in 19 per cent, and varied in from 1 to 4 of the 10 results in 60 per cent. Of the latter, 20 per cent varied in 1 test, 20 per cent in 2 tests, 12 per cent in 3

tests, and 8 per cent in 4 tests. In other words, if a specimen of blood from the same individual be submitted to 10 tests by different serologists, there is 1 chance in 5 that the tests will agree."

This report therefore throws grave doubt upon the accuracy of the diagnosis of syphilis made on the Wassermann reaction alone, and in reviewing over 500 health records taken at random it appears that many cases have been diagnosed as syphilis by placing absolute reliance on the positive Wassermann test in the absence of clinical symptoms.

I have talked to a number of serologists in Philadelphia, and they all tell me that, while they are confident of their own interpretation of this test, others make many mistakes in technic. The article of Drs. Uhle and MacKinney shows conclusively for Philadelphia at least that in this city five of the most competent laboratories, conducted by experts, most of whom are connected with teaching institutions, disagree in the majority of cases.

These tests were performed by men who are making a life study of laboratory work and have every possible advantage and aid to accuracy, yet all these discrepancies occurred. If these experts are able to agree in only 21 per cent of cases it seems fair to presume that the naval medical officer who is performing Wassermann reactions will not have greater success in accuracy.

Syphilis in the great majority of cases is an easily recognized disease, and before the introduction of the Wassermann test there never was much difficulty in making the diagnosis. At present we have in the dark-ground illuminator an easy and accurate means of differentiating between chancre and chancroid, so that in no case need treatment be delayed. In the past year the writer has had occasion to examine many health records of men being transferred or discharged and the frequency with which syphilis has been diagnosed on the Wassermann alone has seemed unjustifiable. No one should be compelled to bear the stigma of being a syphilitic without a positive diagnosis.

A few examples follow:

1. Lieut. —. Was treated for a sore throat which returned to normal in about three weeks. In the meantime his blood had been taken and on the strength of a positive (although stated "weakly positive") Wassermann a diagnosis of syphilis was made and he was given an extended course of mercurials. There were never any other signs of the disease and the officer vehemently denies any exposure.

2. Carpenter —. Had been treated for years for "stomach trouble." Finally he was admitted to a naval hospital, where on the strength of a positive Wassermann reaction salvarsan was administered and mercurials started. Never had any other signs of the disease and denied any luetic history.

3. Pay clerk —. Twenty-seven years' service. Appeared before a retiring board for chronic parenchymatous nephritis. Urine contained albumin and casts. In his health record appeared "Wassermann positive." No antisyphilitic treatment was given, but this entry alone brought up the question of line of duty on his retirement. He absolutely denied venereal history of any kind.

4. F—. (Extract from health record.) Admitted with "hypertrophy of tonsil. Duty, sequel to tonsillitis; requests tonsillectomy."

"Both tonsils removed entirely by snare." Wassermann positive plus 4. There is a general adenopathy. States he knows of no sore or other lesion which is associated with a syphilitic condition. D. and A: Syphilis. Not duty; veneral. Article 2902 complied with. "Denies ever knowing of having condition until blood tests were taken." Admits possibility without knowing of condition.

5. G—. Three notes appear on health record.

October 30, 1912: Wassermann weakly positive.

November 22, 1912: Wassermann faintly positive.

December 11, 1913: Wassermann negative.

"A. January 9. Syphilis; origin not in line of duty; venereal. Article 1020A complied with. Has slight general adenopathy. Wassermann test taken yesterday reported faintly positive. To hospital for an injection of 606."

The patient spent 22 days in the hospital, where he was given two injections of salvarsan. On admission it is stated "no open lesions at present time." On March 20, 1913, Wassermann negative. "All treatment discontinued." April 22, 1915, "Wassermann negative."

This case received two intravenous injections of salvarsan early in 1913 on the strength of a weakly positive Wassermann, and has never had any other treatment. Yet his Wassermann test is negative, both in March, 1913, and April, 1915.

6. Mrs. M—. This woman was the wife of a private marine who had had syphilis diagnosed on his health record by a positive Wassermann test about four months before impregnation had taken place. The husband presented no signs of the disease, the wife showed no signs of the disease, and I delivered her of a perfectly healthy infant.

7. A—. August 2, chancroid.

"RA. There are two large ulcers on body of penis, one beneath prepuce, all of which are becoming indurated. There is a beginning general adenopathy."

August 7: Wassermann plus.

Discharged to change of diagnosis to syphilis. Treatment biweekly intramuscular injections of mercuric salicylate with potassium iodid grs. 10 t. i. d.

August 18: "Wassermann negative.

"Treatment stopped for a few days to see if Wassermann positive could be obtained."

August 27: Wassermann negative.

September 3: Wassermann negative.

September 20, 1915: "Repeated Wassermann tests have been made and only the first one positive. All since that negative, even after resting a month from treatment. It is probably better that he receive no treatment, but simply be observed closely for four or five months and another test taken." (This case shows absolute reliance being placed on the Wassermann test for treatment.)

8. D—. July 27. Gonococcus infection unqualified. "Urine shows pus cells, but no profuse urethral discharge. Pus from urine shows gonococci present. Vesical irritation not so very marked. Wassermann plus 4. Patient told of the condition, but flatly denies any venereal sore and does not believe he has syphilis. Discharged to be admitted with syphilis."

August 3: "Syphilis. Origin not duty. Venereal. Article 2902 complied with. States that he does not deny that he has condition, but does not know when he contracted condition. Refused treatment until thoroughly explained to him.

"*No other symptoms present besides Wassermann reaction.*"

9. S—. Admitted with hernia and operated. Infection developed in line of incision. After 65 days' treatment the entry appears, "Patient admits syphilitic infection two years ago. Treated nine months. Wassermann 4 plus. Received salvarsan, 0.6 gm., intravenously. Sharp reaction from 606. Severe diarrhea. As salvarsan affected this patient unfavorably, it is recommended that his treatment by mercury be continued."

10. J—. This case is the shortest of all. The following is his complete health record: "A. May 4. Syphilis. Origin not in line of duty; venereal. Wassermann 1. Neosalvarson 0.6 gm. May 5. To duty."

11. "RA. June 4. Syphilis. Not duty. No statement. Article 2902 complied with. Given 0.6 gm. salvarsan. No symptoms. June 5. To duty."

12. G—. "April 26, 1915. Admitted syphilis. Origin not duty. Article 2902 complied with. No statement desired. Patient had a lesion a month ago which upon blood examination is shown to be a chancre. Wassermann plus 4. Admitted and discharged for record."

None of these cases described above would have been admitted to the sick list with syphilis if no Wassermann had been made. An interesting question comes up here in regard to venereal prophylaxis. This has not shown the great diminution in the ratio of syphilis

which was expected. Might not these additional cases, diagnosed as syphilis on the strength of a positive Wassermann alone, be the reason for a great number of sick days ascribed to syphilis which were not recorded prior to the universal acceptance of the Wassermann test?

It is not the intention of the writer to attempt to deny the great value of the Wassermann reaction, but it is to draw attention to the fact that a single positive report is not proof positive of the existence of syphilis. There are too many discrepancies among the reports of the best serologists for this to be the case. Therefore it would seem wise to pay more attention to the clinical manifestations than seems to be the present tendency, and to use the Wassermann only as an added link in the chain of evidence.

U. S. NAVAL MEDICAL SCHOOL LABORATORIES.

litions to the pathological collection, United States Naval Medical School, January–March, 1916.

Accession No.	Tissue.	Diagnosis.	Collected by or received from.
....	Kidney.........	Hypernephroma..	Passed Asst. Surg. E. H. H. Old.
....	Nasal smears.........	Leprosy.........	Surg. R. Spear.

tions to the helminthological collection, United States Naval Medical School, January–March, 1916.

ccession No.	Parasite.	Host.	Collected by or received from.
....	Hookworm, ascaris, and trichocephalus (ova).	Cuban native.....	Surg. R. Spear.
....	Fasciolopsis buski.........	Pig.........	Asst. Surg. W. B. Hetfield.
....	Ancylostoma duodenale.....	Homo.........	Do.
....	Ova of ascaris and Ancylostoma duodenale.	.....do.........	Do.
....	Filaria immitis.........	Dog.........	Do.

SUGGESTED DEVICES.

AN APPARATUS FOR FILLING VACCINE AMPULES.

By R. G. Davis, Passed Assistant Surgeon, United States Navy.

A simple apparatus for filling vaccine ampules, which eliminates all contamination, with practically no loss of vaccine, was devised by Hosp. Steward D. C. Allen and is now in use at the United States Naval Hospital, Canacao, P. I.

This apparatus, as shown by the accompanying plates, consists of a guide and shield and a pipette, both of which can be made in any laboratory and require little skill in glassworking.

The guide and shield (fig. 1) is made from a piece of glass tubing, 15 cm. long and 8 mm. inside diameter, drawn until the constricted portion (*a–a*) measures about 5 cm. in length and about 2 mm. in diameter in the narrowest portion (*b*) and finished with a bell-shaped flare at the bottom (*c*). The top is finished with a flange (*d*).

The pipette (fig. 2) is made of a piece of glass tubing 25 cm. long and 7 mm. outside diameter. Two bulbs (*a–a*) are blown in this tube, about 2 cm. apart, both of sufficient size to prevent them from passing through the top of the guide (*d*, fig. 1). The bottom of the pipette is drawn to a needle (*b*) 6 mm. long and about 1 mm. in diameter. The top (*c*) is flanged slightly for attaching rubber tubing.

Figure 3 shows the pipette inserted into the guide. The bulb (*a*) rests on the flange of the guide (*b*) and prevents the shoulders of the pipette and guide (*c–c*) from touching. The ampule (*d*) is inserted into the bell of the guide, the neck just touching the narrow portion of the guide (*e*).

The "cut-off" (fig. 4) is made of glass rod bent as shown.

Plate No. 2 shows the *modus operandi.*

The container is fitted with a rubber stopper with two holes. Into one of these holes a glass air tube is inserted (*a*). This air tube extends to the bottom of the container on the inside and continues well up on the outside ending in a small funned (*b*), the air filter, into which sterilized cotton moistened with tricresol is placed.

Into the other hole of the rubber stopper a glass tube is inserted to which a rubber tube is attached. The glass "cut-off" is then slipped over the rubber tubing and the pipette is attached (*c*).

The container is then inverted and placed in an apparatus stand (*d*).

The pipette is grasped by the thumb and forefinger between the two bulbs (the upper bulb preventing the pipette from slipping through the fingers). The middle finger is passed through the angle of the "cut-off" (as at *e*). This will cause a "kink" in the rubber

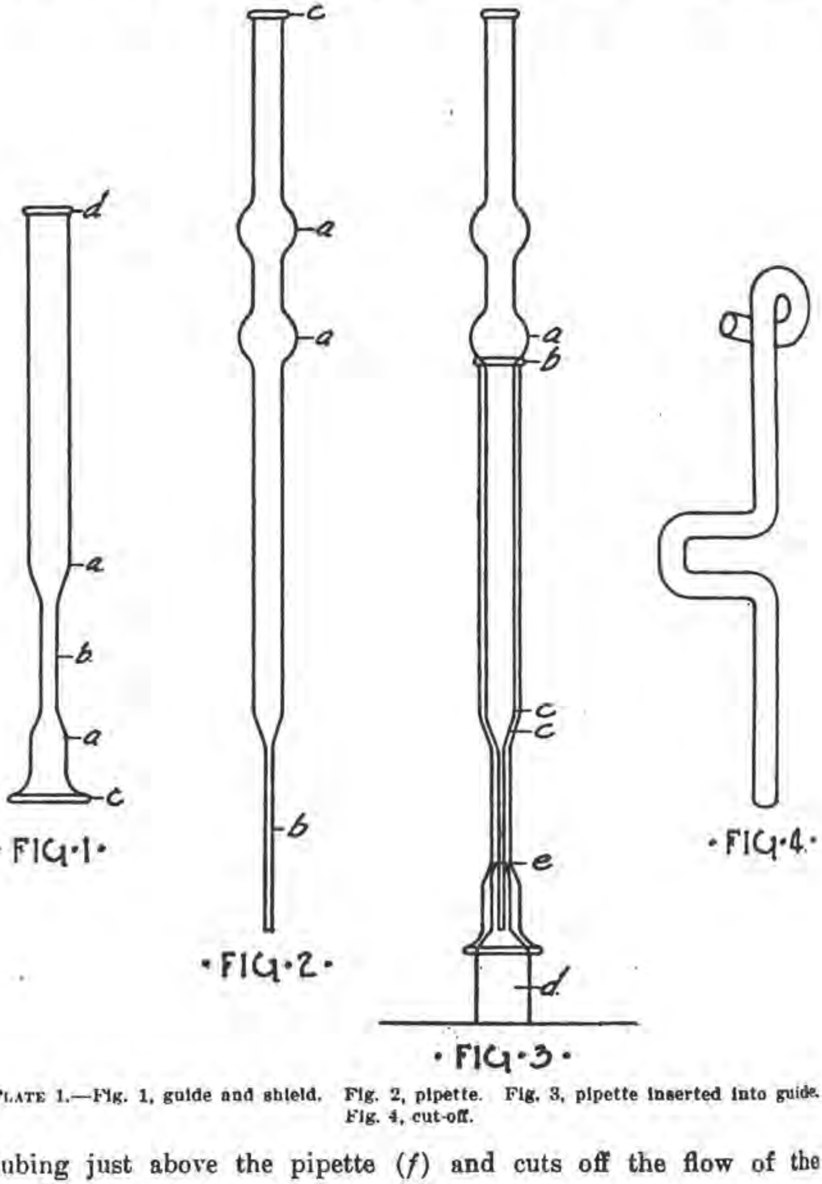


PLATE 1.—Fig. 1, guide and shield. Fig. 2, pipette. Fig. 3, pipette inserted into guide. Fig. 4, cut-off.

tubing just above the pipette (*f*) and cuts off the flow of the vaccine.

The pipette is then inserted into the guide and when lowered until the lower bulb (*g*) touches the top of the guide, the vaccine will flow.

The flow is cut off by simply raising the pipette which produces the "kink" as shown in figure 5.

If it becomes necessary to leave the apparatus while in operation it is only required to let the pipette rest in the guide, the weight of the "cut-off" will produce the "kink."

When in operation a container with boiling water is always kept near and the ends of the guide and pipette are dipped into it at frequent intervals to insure against possible contamination. It will be readily seen that as the pipette touches the guide only at the top

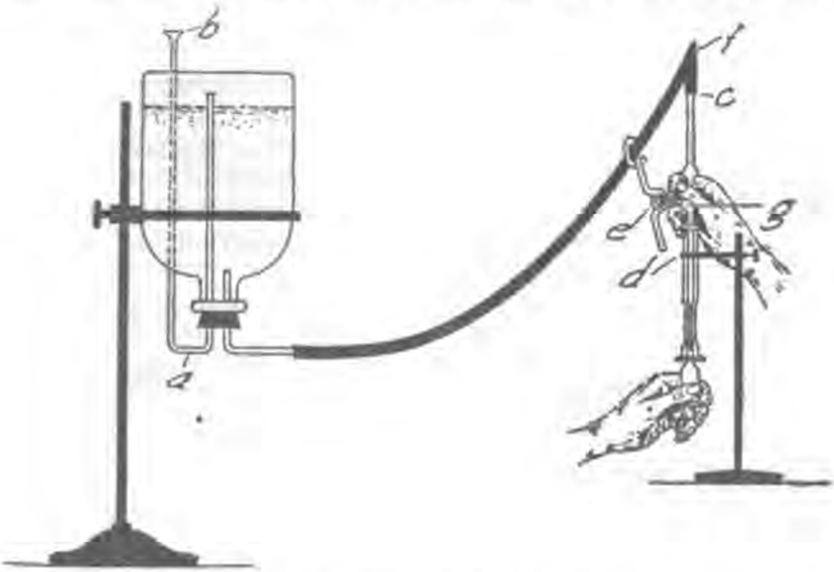


PLATE 2.—Apparatus in operation.

and does not come in contact with the ampule (if the ampule is held tightly against the guide) the danger of contamination is practically *nil.*

This apparatus has given excellent service at this hospital, 2,000 c. c. of typhoid vaccine being put up and sealed in 5 and 10 c. c. ampules within an hour. Before it was put into use a great amount of typhoid vaccine was lost in filling ampules; also large quantities were lost, due to mould, after being sealed in ampules. At the present time there is practically no loss in filling ampules and none has been lost on account of mould.

METHODS OF PREVENTING THE ALTERATION OF TINCTURE OF IODIN IN MILITARY SURGERY.[1]

Translated by J. A. BIELLO, Passed Assistant Surgeon, United States Navy.

Following the publication of an article by Rho in *Annali di Medicina Navale e Coloniale*, January, 1915, in which several questions were discussed concerning the preservation of tincture of iodin, I was assigned the pharmaceutical studies:

1. Research for the determination of the best means to be adopted to prevent the alteration of tincture of iodin in time of war—

(*a*) To prevent the development of iodidric acid (an irritant element to be avoided in the treatment of wounds).

(*b*) Whether the addition of iodic acid is advantageous as proposed by Prof. Gaglio.

(*c*) Whether it would be easier and more economical to have a special powder of metallic iodin (to be contained in vials according to the suggestion of the French military pharmacist Gautier).

(*d*) Or if it would be better to use compressed soluble tablets according to the suggestion of Pellerin.

(*e*) Or to substitute benzol for alcohol as a solvent in order to prevent the formation of iodidric acid.

2. If it is advisable that small vials containing tincture of iodin be added to the individual packets according to the French system.

3. To ascertain whether the formation of iodidric acid occurs to a greater extent in the dark than in the light as reported by Landrieu.

Leaving the therapeutical considerations of the drug aside, it is agreed that the best official form of the alcoholic tincture of iodin for surgical use is that of 5 per cent strength, as generally recognized by military surgeons during the campaign in Libya, and that the alcoholic tincture is to be preferred on account of the undoubted disinfecting properties of alcohol itself. It is not, therefore, advisable to use the chloroform tincture of iodin as proposed by Chasevent on account of its greater volatility and a greater cost of the solvent. The tincture of iodin with bichlorid of ethylene is also to be condemned.

Neither is the benzol tincture to be considered for the following reasons:

1. The volatility of the solvent, which is far superior to that of alcohol and for which the tincture soon loses its title.

2. On account of the inflammability of benzol.

3. On account of the odor and emanation of benzol, which is very objectionable to patients.

4. Because benzol at the temperature of 3° C. crystallizes, and in the winter months in order to redissolve the iodin, the heat of the

[1] E. Gianturco, farmacista direttore di 2ª classe della R. Marina. Annali di Medicina Navale e Coloniale, July, 1915.

nd is not sufficient, and one must resort to artificial heat which es rise to the danger from inflammability of its vapors.

The alcoholic tincture of iodin has the inconvenience of altering y quickly and becoming inactive on account of the formation of idric acid, which can reach the proportion of one part of acid to parts of iodin contained in the tincture. The formation is due to action of iodin on alcohol as shown in the following equation:

$$2C_2H_5OHI_2 = C_2H_4O + C_2H_5I + HI + H_2O$$

ch are aldehyd, ethyliodid, iodidric acid, and water. Iodoform also be produced in this reaction.

o avoid or retard the formation of iodidric acid in the alcoholic ure of iodin it has been recommended to preserve it in bottles lack and yellow glass which will not allow the chemical rays to . Landrieu instead recommends the preservation of the tinc- in white glass bottles, and open to the light, which he says pre- s its decomposition and the formation of iodidric acid. Having several series of experiments I have observed that the action ght has no influence to accelerate or retard the formation of ric acid, since in the tincture of the Italian Pharmacopeia, pre- d in yellow glass and in the dark, and in that preserved in glass and in the light, we found iodidric acid in equally small ; on the other hand in a tincture exposed to the heat of the sun, urs after its preparation we found a much larger quantity of ic acid. Following the above experiences, I concluded that a r temperature favors the alteration of the alcoholic tincture of while the influence of light has no effect whatever. To prevent rmation of iodidric acid in the alcoholic tincture Gautier has sed to precipitate the iodin to the powder state and with this r of iodin, which is more rapidly and more easily soluble in l, one can extemporaneously prepare the tincture. This d is of little value for obvious reasons and because it requires rious preparation to pulverize the iodin. M. Courtot on the hand in order to render the tincture unchangeable has pro- to add either 4 per cent of potassium iodid or 3.6 per cent of iodid. I have assured myself experimentally that the above- ned additions are sufficient to prevent the formation of iodid- l in the tincture even when this is kept at a temperature of 27° ° C., while a tincture with 3.5 per cent of potassium iodid is ogether unalterable as was demonstrated also by Budda and son, and for this reason the United States Pharmacopeia pre- a tincture of iodin with 5 per cent potassium iodid as a pre- e.

, the above method of preserving the tincture of iodin, *i. e.*, e addition of either potassium iodid or sodium iodid, is based

the composition of the compressed tablets proposed by Pellerin for the instantaneous preparation of the alcoholic tincture. Each of the tablets contains 1 gram of iodin and prepares 10 grams of the tincture, and they are placed on the market by Robert and Carrière, of Paris, under the name of Iodules. The method of preparing the alcoholic tincture of iodin with potassium iodid or sodium iodid has met with much favor in France, but has also been subject to some criticism on the point that the presence of an alkaline salt in the tincture may cause some inconvenience in the practical use of the preparation, because, while iodin, on account of its volatility, is absorbed by the skin, the iodids are not absorbed, and neither have they the disinfecting action of free iodin.

Another method of preparing tincture of iodin extemporaneously also recently proposed is that which is obtained by the tablets known as Iodoine. These tablets come in pairs, one containing tartaric acid and the other made up of a mixture of sodium iodid and sodium nitrite in such proportions that when all the nitrite is decomposed there is liberated 0.5 gram of iodin when dissolved in 10 c. c. of water, so that with these tablets one obtains not an alcoholic but an aqueous solution of iodin of 5 per cent strength.

This preparation, however, in addition to the objections found in the solutions of Courtot and Pellerin, has also the objection of containing an alkaline tartrate, the presence of which is not at all innocuous, and, besides, it lacks the advantage of the solvent action of alcohol, which promotes the absorption of the iodin and is in itself a disinfectant.

Generally, in order to eliminate iodidric acid in an alcoholic tincture in which it may have formed, and also to prevent its formation, Profs. Gaglio and Roques have proposed the addition of crystallized iodic acid, which in the presence of iodidric acid form iodin and water as shown by the following equation:

$$5HI+HIO_3=3I_2+3H_2O.$$

That the addition of 1 per cent iodic acid is sufficient to transform all the iodidric acid which may form in a tincture is shown by the fact that the iodic acid can be seen unaltered at the bottom of the bottle containing the tincture, owing to its insolubility in alcohol, and thus in itself acts as an indication of the purity of the tincture.

Iodic acid is not a caustic, and as an antiseptic it can not but be of advantage. It is a very sensitive reagent for the demonstration of the presence of iodidric acid in an alcoholic tincture of iodin. As a test it may be used as follows:

Dilute 1 c. c. of the tincture with 5 or 10 volumes of water in order to precipitate the iodin. Filter and add a crystal of iodic acid. The

result is a turbidity and a further precipitate of iodin, the quantity of which is proportionate to the amount of iodidric acid in the tincture.

In conclusion, of all the proposed methods of preventing the alteration of the alcoholic tincture of iodin, the addition of 1 per cent of iodic acid, as prescribed by Prof. Gaglio, is the best, because it has no objections. In the tincture the presence of the unaltered iodic acid deposited at the bottom of the container is an assurance that the tincture does not contain iodidric acid, besides iodic acid is not a caustic, but is a good antiseptic, and is a sensitive reagent to discover the presence of iodidric acid in any tincture that may contain it.

From the economic standpoint, the use of 1 per cent of iodic acid as a preservative of the tincture costs one-third less than the use of 4 per cent potassium iodid or 3.6 per cent sodium iodid as proposed by Courtot.

It is, therefore, highly advisable that this important and useful suggestion of Prof. Gaglio's be generally adopted and be made obligatory in military pharmacies, for the special reasons that the adoption of such a rule is most essential since military pharmacies are to furnish the article which may remain unused for long periods of time, so that when the occasion for its use suddenly arrives, the possible irritant and noxious action of iodidric acid can be avoided.

CLINICAL NOTES.

REPORT OF TWO CASES OF INTUSSUSCEPTION AS A SEQUEL TO WHOOPING COUGH.

By C. W. Depping, Assistant Surgeon, United States Navy.

Whooping cough, as is well known, is especially dangerous by reason of its sequelæ. In a widespread epidemic in Guam we have found two cases of intussusception developing after severe paroxysms of coughing. In both cases it took place about one month after the onset of the disease, or while the disease was at its height. The appendix and cecum were invaginated into the ascending colon. In both instances the symptoms was not marked enough to warrant a diagnosis of intussusception, and it may also be stated that it is very difficult to obtain consent to an operation among the natives.

Case I.—A native female child, 6 months 14 days of age, was admitted to the hospital suffering from whooping cough of about three weeks' duration. She was given the usual sedative treatment and also small doses of antipyrin. After a few days' stay in the hospital she had a severe vomiting spell following a paroxysm of coughing. No other symptoms developed, and no particular attention was paid to this, as vomiting occurs very often after severe coughing spells. About 10 hours after the initial vomiting spell the child began to vomit again; at this time no rigidity or abdominal tenderness could be elicited, or any tumor made out. The vomitus was not fecal in character and had no fecal odor. A few hours later the abdomen became distended, and a small amount of blood was passed by rectum. The child's condition became worse, and it died about 15 hours after the first paroxysm.

On autopsy, when the abdominal cavity was opened, a small amount of fluid was found. The appendix, which was quite large, together with the cecum was found invaginated in the ascending colon to nearly the hepatic flexure. There was quite an exudate, plastic in nature, about the intussusception portion of the gut, showing that the condition was present for some time before death.

Case II.—A female native child, aged 4, much emaciated and in very poor physical condition, was admitted to the naval hospital for whooping cough of about one month's duration. This case, as the foregoing, began with vomiting spells and the passing of a slight amount of blood by rectum. The abdomen became distended, but

on palpation no mass could be made out. The vomitus was not of a fecal character at any time.

On autopsy the small intestine was found distended with gas. The appendix and cecum were found invaginated into the ascending and transverse colon as far as the splenic flexure. The appendix was found closely adherent to the posterior wall of the cecum. The invaginated portion of the gut was very edematous and thickened, and a granular exudate was present on the adhering surfaces. There were no gangrenous areas. The mesenteric glands were slightly enlarged. Numerous *Ascarides lumbricoides* were present in both the large and small intestines.

TREATMENT OF A FRACTURED FEMUR BY MEANS OF A STEINMANN NAIL.

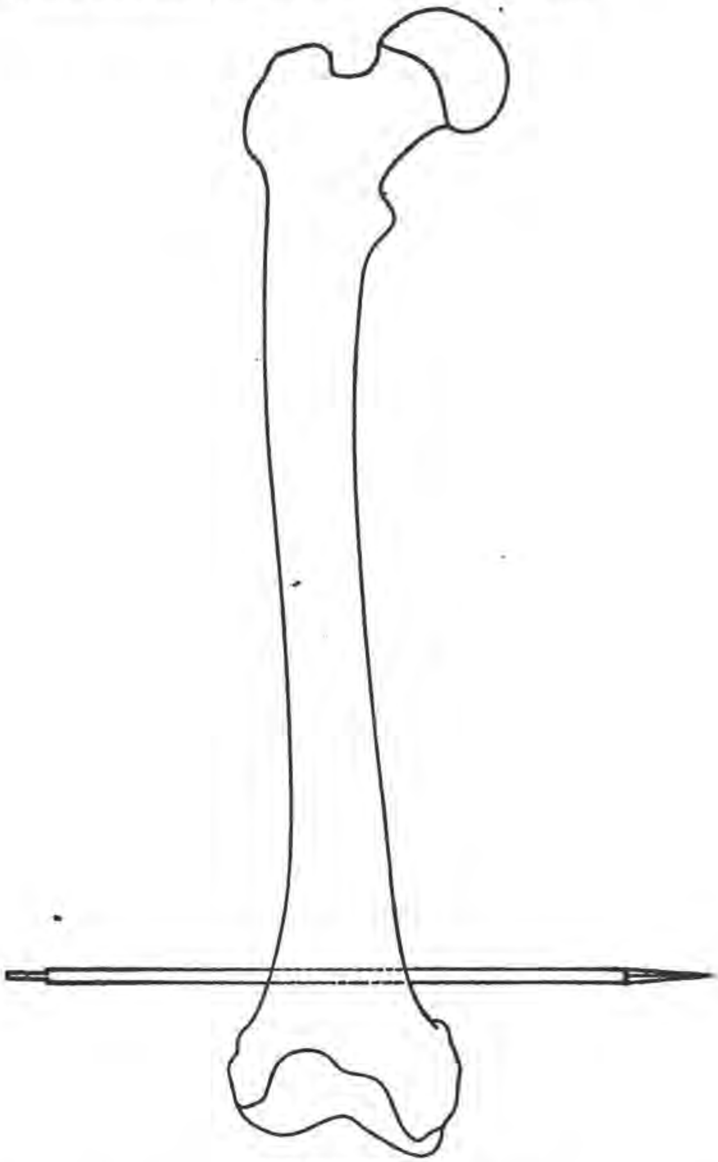
By C. W. Depping, Assistant Surgeon, United States Navy.

In treating a fracture of the femur it is essential to have strong and steady traction on the lower fragment and to keep the ends of the bone in apposition. The required traction is often maintained by means of long adhesive strips and counter extension by fixing the pelvis. This method undoubtedly has its advantages, but in the Tropics the use of adhesive is very unsatisfactory, owing to the fact that the heat soon changes the plaster so that it will not adhere to the parts. It also tends to make the patient, who naturally perspires a great deal, very uncomfortable, and pressure sores soon develop wherever the strips come in contact with the skin. Then, too, if the proper amount of weight is applied the strips are very apt to pull off. It is also very hard to keep a good steady pull on the lower fragment and to hold the ends of the bone in firm apposition, as the strips are more or less elastic.

In a recent fracture of the femur the Steinmann nail was used with very good result. The patient was admitted to the hospital June 25, 1915. A lifeboat, under which he was sleeping, in falling from the davits struck his right leg at about the middle of the femur, causing a fracture about 5 inches above the knee joint and causing considerable contusion to the overlying muscles.

The adhesive extension dressing was applied, but when the required amount of weight was attached it loosened the strips, and in a few days pressure sores began to develop. It was decided to use a Steinmann nail, and as there was no way of getting one here the blacksmith made a very good substitute. He used a steel tool of about one-fourth inch diameter, and the length of the nail over all was 10 inches. The diameter was a little greater than it should be, but owing to the fact that the steel was flexible a heavier piece had to be used in order to insure sufficient rigidity. One end of the

piece was ground down to a brad-awl point and the other was so ground as to fit snugly into a brace. The pin bores its own passage through the bone much in the same manner as a drill.



Steinmann nail *in situ*.

In this case the nail was inserted through the condyles of the femur transversely, the usual site being from ½ to 2 inches above the knee joint. It is better to go just a shade above the condyles than exactly through their centers, as here the bone is more compact; and, there-

fore, the nail holds more firmly. It must be remembered that strict asepsis is essential, the nail and bit-stock being boiled and the site of insertion and exit painted with tincture of iodin. The nail should make its own opening in the skin, but some prefer to make a small skin incision and then drill the pin through the bone, a stitch above and below the pin closing the skin incision and fitting it snugly about the pin. If the pin makes its opening into the skin, care should be taken that there is no undue tension on the skin, and if there is a small incision it should be made so that the skin lies smoothly about the pin. Utmost care should be taken that the tissues surrounding the entrance and exit of the pin do not become infected and break down, and this is best obtained by having the skin lie smooth and without tension. The openings about the pin are sealed with gauze and collodion, which is allowed to remain until it drops off.

The patient is given preferably gas anesthesia, or, if that is not at hand, ether is used. The site of operation is cleaned and washed the day before, and iodin painted on just before the pin is inserted. The pin is then drilled transversely through the bone as above described. The pin makes its way easily through the bone and very little force is required in inserting it. The pin fits snugly in the bone and there should be no free play. A cork can be placed on the brad-awl point of the pin, so that no injury can be done to the other limb.

After the pin is inserted and while the patient is still under the anesthetic the bone is set. As this is usually done in the same bed that the patient is to occupy, it is best to have this prepared beforehand. Two upright pieces of wood are fastened to the bed, one at the head and the other at the foot to the right or left of the center, depending on whether the right or left leg is injured. These uprights should be about 3 feet above the bed, and they are joined by a horizontal piece. To this horizontal piece a pulley is fastened, through which the cord passes that is attached at one end with the Steinmann nail and carries at its other end the proper weights. A loop of cord is made, one end of which is fastened to the inner side of the nail and the other to the outer side, and to the apex of this loop is fastened the cord which passes through the pulley and carries the weights. It is best to use the regular toggle-irons made for the purpose, which grasp each end of the pin and are adjustable to the width of the leg, but the cord answers the purpose after a fashion.

The bone having been set, the loop of cord adjusted to the ends of the pin, and the long cord attached to the apex of the loop and passing through the pulley, it only remains to attach the proper weight. The old rule of a pound for every year of age up to 20 is a good one, but in a man of good muscular development it sometimes becomes necessary to add considerably more in order effectually to tire out

e muscles. The main thing is to keep the ends in apposition and ough weight should be carried to obtain this. In this particular se about 30 pounds were found to be necessary.

In order to prevent the patient from displacing the fragments dur- g sleep a double inclined plane was put under the injured member l the thigh bandaged to it. This prevents backward and forward placement of the fragments and does not have to be kept on for a at length of time. The ends of the bone fragments can also be ated by attaching cords to either the inner or outer end of the pin, l by shortening either one or the other the leg can be rotated ard or outward. To get the counterextension a perineal pad is l and a board is placed across the foot of the bed, against which sound foot rests, which effectually prevents the patient from ping to the foot of the bed.

he result in this particular case was very satisfactory, notwith- ding the muscle bruising and tearing. There was no shortening, patient was entirely comfortable, and only two small scars show re the pin was introduced. After the fracture has united firmly, lly at the end of the fifth or sixth week, the pin can be removed. is readily done by attaching the bit-stock and turning the handle ter-clockwise. At times the pin may start a little hard; if that is case, start to drill the pin a little farther through the leg and reverse, when it will come out easily. It may be necessary to an anesthetic, preferably gas, when removing the pin.

AN UNUSUAL CASE OF HERPES ZOSTER (ZOSTER NUCHAE ET BRACHIALIS).

By W. E. EATON, Passed Assistant Surgeon, United States Navy.

rish to report a case of herpes zoster of unusual severity and on, and of extensive distribution, which I was invited to see at Government Hospital for the Insane in consultation with Dr. O'Malley, of that institution, who also furnished the accom- ng photographs.

e eruption was most marked, located upon the left side, its dis- ion extending completely around the neck, over the upper back, chest, over the shoulder, and down the front of one arm, fol- g the line of the brachial trunks almost to the bend of the elbow. *posterior* outline extended from the occipital protuberance the median line to about the seventh cervical spine. The *ante-* utline extended from the hyoid bone down the median line of eck and sternum to about the junction of the manubrium and lus. The *superior* outline extended from the occipital pro- nce along the line of the hair and a line from the mastoid

process to the hyoid bone. The *inferior* outline was irregular, but in a general way extended from the seventh cervical spine along the spine and acromial process of the scapula, the lower posterior border of the deltoid muscle, along the third rib in front over the shoulder, thence down the arm.

There first appeared an area of redness on the back of the neck which rapidly enlarged until the entire involved area of skin was quite red.

The typical eruption of small vesicles soon appeared and seemed at once to break out over the entire area involved. The vesicles soon coalesced. When seen by me the area was a dull pink-red, and covered almost entirely by a crusted vesico-pustular eruption. There were practically no areas of the skin within the area involved which were free of lesions. The outbreak extending down the arm gradually became smaller in area until one fairly large vesicle terminated the condition.

There was nothing particularly unusual in the lesions themselves.

The existence of pain could not be determined owing to the patient's markedly demented state.

The condition healed in about two weeks, being delayed by infection of the vesicles and the general debility of the patient.

As to the etiology, from the fact that the patient has been tubercular since 1907, and is now in an advanced stage of pulmonic phthisis, it is believed that the possible presence of inflammatory or infectious influences from this (tuberculosis) cause, together with exposure to cold or damp weather conditions on the tubercular porch, can be readily accepted. There is nothing in the previous history, other than the presence of insanity and marked mental deterioration, which seems to have a bearing on the condition.

CASE OF HYPERNEPHROMA.

(Copy of health record with autopsy and pathological report.)

By E. H. H. OLD and R. H. LANING, Passed Assistant Surgeons, United States Navy.

Patient: M. J. J.—Oiler, United States Navy.—Admitted, U. S. S. *Leonidas*, March 10, 1915. Diagnosis: Nephrolithiasis. Origin: Duty. Patient on his fourth enlistment. Patient has symptoms of calculus formation in the left kidney. Claims to have had a slight attack of renal colic last November. Was on the binnacle list for two days in February complaining of slight left-sided pain. Urine tested for blood, but test not satisfactory. Claims to have passed some blood at this time. Symptoms soon abated, however, and patient allowed to go back to duty.

Yesterday patient while at stool was seized with a violent pain and collapsed. Was assisted to the sick bay and put to bed. Was in a slight state of shock. Pain begins in left renal region and passes to the left loin. Patient passed about 2 ounces of bright arterial blood. Following this he had a complete anuria for about 12 hours. Under stimulation the urinary flow reappeared, but the urine contains a large amount of blood.

March 11. General condition better, but is still passing bloody urine.

March 15. Improved. Blood has practically disappeared from the urine.

March 26. Patient had another attack of renal colic and hematuria, though not as severe as the first one.

March 29. Urine clearing up. There are numerous pus cells in the urine. Afternoon temperature, 99.5° to 100°; pulse, 100. Complains of pain in left groin.

April 8. Patient improving, but is again passing blood. There was only slight colic this time.

April 11. Board of medical survey recommended that patient be transferred to the U. S. S. *Hannibal* for further transfer at New Orleans, La.

April 16. Transferred to U. S. S. *Hannibal* in accordance with above survey.

U. S. S. *Hannibal*, Punta Gorda, Nicaragua. Readmitted, April 16, 1915. Diagnosis: Nephrolithiasis. Origin: In line of duty. See admission. Transferred to this ship from U. S. S. *Leonidas* for disposition upon arrival at New Orleans, La.

April 19. Slight hematuria. Few blood clots in urine. Variation of 1° in morning and evening temperatures.

April 20. Red count 2,700,000. Hemoglobin 80 per cent.

April 21. Macroscopic blood in urine. General condition good. Pus in urine.

April 24. Transferred to United States Marine Hospital, New Orleans, La., for treatment.

May 3. Accounts and records transferred to U. S. S. *Castine*, New Orleans, La.

U. S. S. *Castine*, New Orleans, La. Readmitted May 4, 1915. Diagnosis: Nephrolithiasis. In the line of duty (see above). This patient is at the United States Marine Hospital.

May 8. Patient complains of intense pain in left kidney region which is almost continuous. Urine negative. X-ray fails to show stone. Patient very anemic.

May 15. Slight improvement but complains of pain in left side. Physical signs negative.

May 23. No change.

June 1. Patient is able to go for short walk each day. Urine dark but negative. Pain left kidney region.

June 15. Patient shows slight improvement and appetite is better.

July 1. Slight improvement. No symptoms of stone. Urine shows numerous pus cells. No stone discernible by X-ray.

July 20. Patient about the same, probably a little stronger.

July 27. Transferred to United States Naval Station, New Orleans, La., for treatment at yard dispensary.

Yard dispensary, United States Naval Station, New Orleans, La. Readmitted, July 27, 1915. Diagnosis: Nephrolithiasis. Origin: In line of duty (see above entries). Patient gives a history of left-sided renal colic in recurrent attacks dating from November, 1914. These were usually accompanied by more or less hematuria. At present he is comparatively free from pain. He vomits occasionally. He has steadily lost weight and strength for the past six months. Ankles swell occasionally. Patient is markedly anemic. Temperature 98.6° to 101° F. Systolic blood pressure 118. Urine shows slight trace of albumin, few casts and renal epithelium, few pus cells, and numerous red blood cells. Feces negative. Abdomen negative except tenderness over left side. Bowels ordinarily constipated. Bleeding external piles exist. Patient is able to be up and around most of the time. Appetite fair. Treatment: Rest, observation, extract cascara, acid astringent ointment for piles. Full diet.

August 3. Little change.

August 10. Blood in urine and pain in region of left kidney.

August 16. Patient surveyed and found unfit for duty and the service. The board recommended that he be transferred by rail to the Naval Hospital, Washington, D. C., for further treatment and disposition.

August 20. Patient has another attack of renal colic, requiring opiates to control and followed by slight hematuria, after which the pain disappeared.

August 24. Improved; up and around.

August 28. Transferred by rail to United States Naval Hospital, Washington, D. C.

United States Naval Hospital, Washington, D. C.: Readmitted August 30, 1915. Diagnosis: Nephrolithiasis. Origin: In line of duty. (See above.)

History: (Family:) Father killed in accident. Mother died with "pleurisy." Brother and sister in good health.

(Past): Generally excellent. Measles. *Venereal:* Denies any infection. *Tobacco:* Excessive. *Alcohol:* Moderate; very little in past year and a half.

(Present): In November or December, 1914, while at work in engine room using a 17-pound sledge he missed the object at which he was striking; felt as if something was suddenly "torn loose" in left side, and about two days later had "cramps" over region of kidney; this gradually became worse in attacks which came on about every 8 to 10 days. In January he noticed blood in urine for the first time.

Two or three months ago, while a patient in the Public Health Hospital, New Orleans, he passed three small stones about the size of a pea. While there he had three or four severe attacks of pain. Says he has had no trouble since June until about two weeks ago.

On arrival at this hospital he complained of pain in left lumbar region posteriorly. Has not passed blood in urine for past few days, but did pass a large amount about a week ago. Has lost 25 to 30 pounds in weight.

Physical examination: Fairly well nourished. Mucous membranes of lips and conjunctivæ pale. Face looks "puffed." Skin is cachectic.

Pupils: React normally to light and accommodation.

Eye grounds: Normal. (Surg. E. J. Grow.)

Heart: Negative.

Pulse: Small. B. P. 110.

Chest: No definite abnormality found.

Liver: Not enlarged.

Spleen: Not enlarged.

Abdomen: Soft. Not distended. No mass felt. Some tenderness on deep palpation over region of left kidney.

Reflexes: Patella exaggerated. Slight ankle-clonus.

Extremities: Not swollen. Slightly enlarged inguinal glands. External hemorrhoids marked.

Urine: Normal, acid, 1015. Quantity of albumin; no sugar. Blood pigment present. Hyaline casts in considerable number. An occasional granular cast. Red and white blood cells fairly numerous. Negative for tubercle bacilli.

Blood: Red cells: 2,010,000.
Hemoglobin: 40 per cent.
White cells: 8,000.
Polys: 69 per cent.
Monos: 6 per cent.
Lymphs: 21 per cent.
Eosin: 4 per cent.
No nucleated reds. Negative for malaria.

Morning T. P. and R.: 98°–96–20.

Evening T. P. and R.: 103°–96–20.

Roentgenogram: No calculi shown.

August 31. Morning T. P. and R.: 100°–74–18.
Evening T. P. and R.: 102°–88–21.

Sputum: Negative for tubercle bacilli.

Noguchi: Negative.

Feces: No parasites or ova found. Some bloody mucus on surface: probably from hemorrhoids.

Urine: Normal, acid, 1010. Heavy trace of albumin. No sugar. Blood pigment present. Few hyaline casts. Negative for tubercle bacilli.

September 1. Morning T. P. and R.: 98°–76–18.
Evening T. P. and R.: 100.4°–87–20.

September 2. Morning T. P. and R.: 98°–74–18.
Evening T. P. and R.: 101.4°–94–20.

Urine: Twenty-four-hour specimen, 1,700 c. c. Normal, acid, 1009. Considerable quantity of albumin. No sugar. Urea 0.8 per cent. 13.60 grammes in 24 hours. Blood pigment present. Few hyaline casts and cylindroids. Rarely a red blood cell. Leukocytes fairly numerous. Guinea-pig injected.

September 4. No change. Temperature normal in morning; around 101° in evening. Fairly comfortable.

September 6. General condition same. Temperature around 101° in evening. Urine in 24 hours: 1,850 c. c.

September 7. Is passing quite a large amount of blood in urine to-day; some large clots present.

Urine: 24 hours, 1,100 plus c. c. Reddish, 1012, large quantity albumin. No sugar.

Urea: 1.4 per cent—15.4 grams in 24 hours. Large amount blood. No tubercle bacilli.

Blood: Red cells: 2,870,000.
Hemoglobin: 40 per cent.
White cells: 7,600.
Polys: 58 per cent.
Monos: 4 per cent.
Lymphs: 35 per cent.
Eosin: 5 per cent.
Myelocytes: 2 per cent.

September 8. *Urine:* Normal, acid, 1011; quantity of albumin. No sugar. Rarely a hyaline cast. Blood greatly reduced. Temperature normal in morning; 102° in evening.

Cystoscopic examination: Bladder found normal. Ureter openings normal. No ulcerations present. Patient complains of large cystoscope, so sounds to be used occasionally to accustom him to instrumentation for future catheterization of ureters.

Depping—Steinmann Nail.

Showing improvised Steinmann nail with cords for extension and inner rotation.

Showing extension apparatus in use.

Eaton—Herpes Zoster.

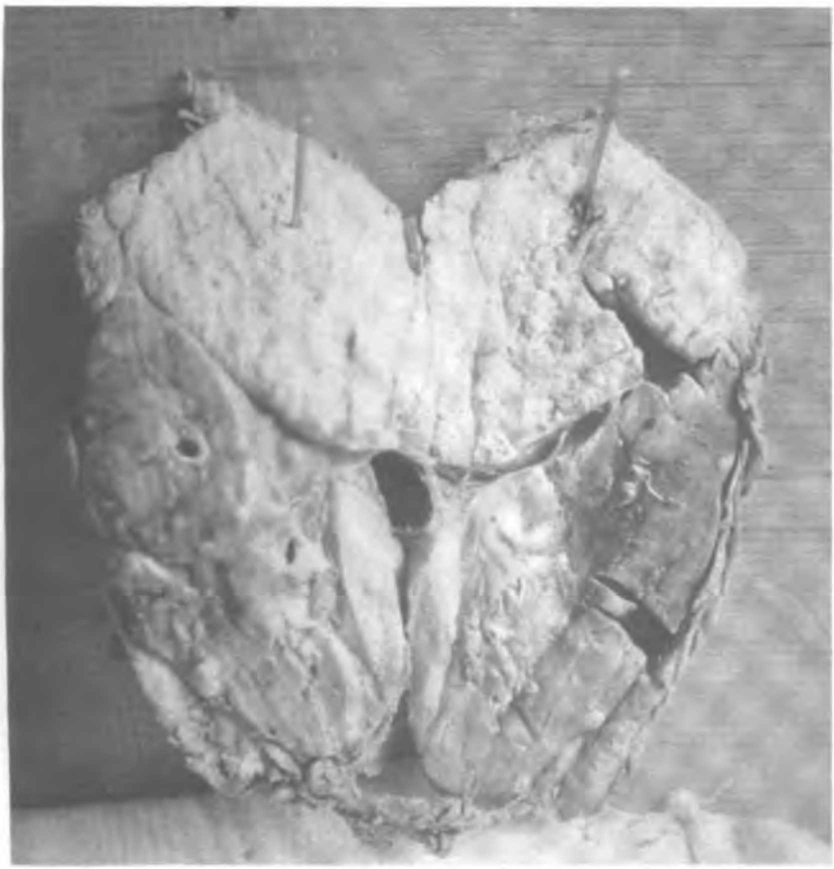


Fig. 1.—"The right kidney mass was adherent to the surrounding structures and twice the size of a normal kidney, being made up of two nearly equal parts, kidney tissue proper studded with discrete, white nodules, and a superimposed tissue cutting hard and marked by fatlike tissue and tissue resembling in structure the above nodules. The line of demarcation between the two parts was absolutely clear."

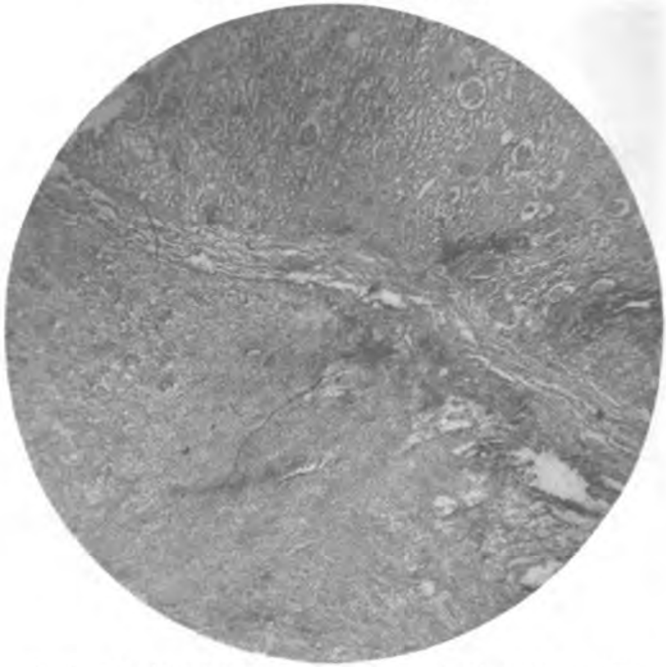


Fig. 2.—"The kidney cortex shows parenchymatous degeneration in the tubules, with congestion and intertubular hemorrhages. There are areas of small round-cell infiltration, and others showing infiltration with the above-mentioned tumor cells."

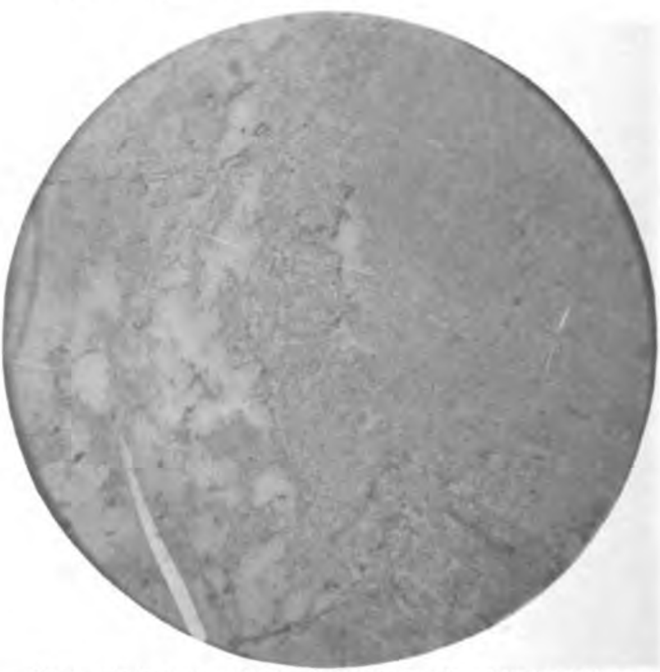


Fig. 3.—"In the lung section is a metastatic nodule surrounded by lung tissue showing serous effusion into the alveoli and passive congestion. The nodule shows two portions—a central area of necrosis and an outer layer made up of cuboidal and spindle-shaped cells resting on very thin connective tissue strands, presenting a suggestion of columnar formation and so loose-meshed as to suggest alveolar tissue."

September 13. *Urine:* Normal, acid, 1012. Quantity of albumin. No sugar. Rarely a hyaline cast. Leukocytes fairly numerous.

Blood: Red cells: 2,260,000.
White cells: 7,800.
Hemoglobin: 40 per cent.

No parasites or other evidence of malaria observed. Patient's general condition same. Given therapeutic test for possible malaria: Quinin sulphate, gr. x, t. i. d., with m. x aromatic sulphuric acid. Temperature normal in morning; 102° in evening.

September 15. Urine shows large quantity of blood again. Negative for tubercle bacilli.

September 16. *Urine:* Blood has disappeared. Normal color, acid, 1011. Quantity of albumin. No sugar. Rarely a hyaline cast. Few leukocytes; an occasional red cell.

Sputum: Negative for tubercle bacilli.

Roentgenogram: Stereopticon of chest taken. No evidence of tuberculosis. Temperature: Morning normal; evening 100.6°.

September 17. Morning temperature normal; evening 100.4°.

September 18. Morning temperature normal; evening 101°.

Urine: Normal, acid, 1007. Considerable quantity of albumin. No sugar. Few hyaline casts. Few leukocytes.

Feces: No parasites or ova found.

Stomach contents:
Total acidity: 20.
Free HCl: None.
Lactic acid: Fair quantity.
Occult blood: None.

Microscopically: Negative.

℞ Basham's mixture, 2 drams, t. i. d.

September 20. *Stomach contents:*
Total acidity: 18.
Free HCl: None.
Lactic acid: Quantity.
Occult blood: None.

Urine: Normal, acid, 1010. Quantity of albumin. No sugar. Rarely a hyaline cast. Few leukocytes.

Temperature normal in morning; 102° in evening. Pulse 80 to 90.

September 23. *Blood:*
Hemoglobin: 55 per cent.
Red cells: 3,000,000.
White cells: 9,600.
Polys: 78 per cent.
Monos: 8 per cent.
Lymphs: 13 per cent.
Mast: 1 per cent.

Urine: Normal, acid, 1013. Small quantity albumin. No sugar. Few red blood cells and leukocytes.

Temperature continues normal in morning; 102° in evening.

September 27. *Urine:* Normal, acid, 1012, heavy trace albumin. No sugar. Rarely a hyaline cast. Few leukocytes.

Temperature normal in mornings; only 101° in evening for past three days. Pulse 88 to 96.

September 28. Patient again passing blood in urine. Has had no pain or chills as has heretofore been the case. Temperature 100° in evening.

September 30. Patient has been having some trouble in passing urine on account of a large clot that has formed in bladder; this morning he passed the clot, which in mass was about one-half the size of a hen's egg; came out in partial fragments and one part looked like cast of ureter. Bladder irrigated later and return flow clear. Urine passed later was clear.

Urine: Normal color, acid, 1012. Small quantity of albumin; no sugar. Few hyaline and granular casts. Few red and white blood cells. Negative for tubercle bacilli. Temperature around 101° in evening.

October 5. Condition has remained about same, but has not had any hemorrhage since September 30.

Blood: Red cells: 3,150,000.
White cells: 10,000.
Hemoglobin: 55 per cent.
Polys: 76 per cent.
Monos: 6 per cent.
Lymphs: 18 per cent.

October 7. *Urine:* Pale, acid, 1014. Small quantity albumin. No sugar. Rarely a hyaline cast. Leukocytes fairly numerous. Patient continues to have fever around 101° to 102° in evening.

October 11. No change in general symptoms.

Urine: Normal, clear, acid, 1016. Quantity albumin. No sugar. Blood pigment present. Numerous granular casts. Few hyaline casts. Leukocytes rather numerous. Occasional red cell.

Sputum: No tubercle bacilli present.

Laboratory report: Guinea-pig injected subcutaneously with sediment from urine on September 4, 1915; autopsied this date. No pathological changes.

October 13. Out of bed in wheel chair daily. Whisky, 1 ounce in milk or eggnog every morning. Increased food.

October 15. Afternoon temperature 102.8°. Blood count: Reds, 2,550,000; hemoglobin, 60 per cent.

Considerable pain over left kidney.

October 21. Not so much pain, but marked tenderness over left kidney. Urine shows hyaline and granular casts (numerous) and an occasional red blood cell. Very heavy trace of albumin. Patient passed two blood clots (ureter ?) two days ago.

October 31. Blood picture and urine about the same. Functional kidney test made this morning by Surg. Fauntleroy shows:

Bladder normal though slightly large. Indigo-carmin (0.16 gm. sol. in 10 c. c. water) injected into buttocks. Blue pigment appeared in less than 5 minutes from right ureter. Left ureter did not begin excreting for 16 minutes. The left ureter functions very slowly (once to every five of right), the amount of urine is also much less, showing not only a delayed but much diminished output. The right kidney is doing practically all the work.

November 6. Time of coagulation of blood three minutes. Put on calcium lactate, gram 1, t. i. d.

November 8. Prepared for operation.

November 9. Under ether Surg. A. M. Fauntleroy, United States Navy, removed the left kidney. The kidney was about twice its normal size and bound down by dense adhesions, particularly at the lower pole, preventing delivery, consequently the ureter and vessels were ligated *in situ*. Muscles brought together with chromic gut; skin sewed with linen. Three drains (cigarette) were left in the wound.

Discharged for change of diagnosis to:

Hypernephroma. In the line of duty.

November 10. Patient reacted well. Dressed. Profuse bloody discharge on dressings. Drains loosened.

November 11. Drain in anterior angle removed. Doing well.

November 12. Middle drain removed. Discharge almost clear; very much less in quantity. Urine shows a quantity of albumin and pus. Patient is bright and very comfortable.

November 18. All drains out. Feeling very well. Passing 1,600 c. c. urine containing albumin and hyaline and granular casts. R. B. C. 2,200,000; hb. 55 per cent.

November 20. Up in wheel chair.

November 30. Patient seems more cheerful but his condition is not improving. Considerable edema of both feet after being out of bed an hour or two. Urine remains about the same.

R. B. C. 2,070,000; hb. 50 per cent.

December 7. Patient complains of pain in arms and legs. Coughs considerably; vomits once or twice in 24 hours.

Urine 24-hour specimen, shows 1,530 c. c. Albumin, heavy trace; urea, 1.2 per cent. Numerous leukocytes, hyaline, and granular casts. R. B. C., 2,060,000; hb., 45 per cent. Blood smears show anisocyto-

sis, poikilocytosis, and very many shadow cells. Patient is gradually failing. The left axillary glands are enlarged and there is dullness over the posterior aspect of the left lung. It is thought that the chain of glands along the iliac arteries is also involved.

December 20. No improvement. Glands are increasing in size. Patient complains of more pain in left arm and both heels.

December 25. R. B. C., 2,300,000; hb., 40 per cent. Condition continues to grow worse.

December 31. No change in general condition; is probably weaker. Attacks of nausea, with vomiting, nearly every day.

Urine: 960 c. c. in 24 hours. Normal color, strongly alkaline, 1011, rather large quantities of albumin. No sugar. Urea, 1.2 per cent; 11.52 grams in 24 hours. Mucus and triple phosphates.

January 10, 1916. Gradually becoming weaker; occasionally delirious.

Urine: Pale, alkaline, 1010, quantity of albumin; no sugar. Numerous hyaline and granular casts; leukocytes very numerous. Triple and amorphous phosphates.

January 20. Patient gradually weaker each day. Delirium more marked. Urine passed involuntarily. No pain.

January 23. Much weaker this morning. Absolute exhaustion. Died at 5.24 p. m.

AUTOPSY.

The subject was a male, aged 39 years. His body length was 69¼ inches, his skeletal development slender, and his general nutrition very poor. The skin was slightly yellow and elastic, and there was a scar on the back from an operation for left nephrectomy. There were two bluish circular spots one inch in diameter on the abdomen, one just above either iliac crest—postmortem discolorations. Postmortem rigidity was poorly developed. The pupils were irregular—right 6 mm. and left 4 mm. in diameter.

Subcutaneous fat was small in amount. There was a moderate amount of clear fluid in the adominal cavity. The omentum, mesentery, and parietal peritoneum were studded with discrete, white, roundish nodules ranging from one-fourth inch in diameter down. The abdominal lymph nodes were enlarged and softened. The gastric mucosa showed small hemorrhages, especially at the cardia, and there appeared to be a thinning of the stomach wall. The liver was enlarged and showed both on the surface and on section the same white, discrete, roundish nodules. The spleen was one-half again as large as normal and showed a cicatrix 1 inch in length situated about 2 inches from the anterior border.

The left kidney was absent. The right kidney mass was adherent to the surrounding structures and twice the size of a normal kidney,

being made up of two nearly equal parts, kidney tissue proper studded with the above-named discrete, white nodules, and a superimposed tissue cutting hard and marked by fatlike tissue and tissue resembling in structure the above-named nodules. The line of demarcation between the two parts was absolutely clear. (See fig. 1.)

There was nothing noted in the pancreas. Both lungs were markedly anthracosed and anemic. The left parietal and lung pleurae were studded with the same roundish, white nodules, while the right pleura was only slightly involved. The apex of the right lung was adherent. The heart showed an antemortem clot in the left ventricle. The cranial contents were not examined.

MICROSCOPICAL PATHOLOGY.

Stained sections from the following parts were examined microscopically: Metastatic nodule in omentum, metastatic nodule in kidney, section through kidney tissue proper and superimposed tumor, metastatic nodule in lung, metastatic nodules in liver, spleen, heart, and stomach. The spleen and heart appeared to be practically normal. The stomach presents a normal appearance, except for small areas of red blood extravasation into the mucosa. The section through the kidney tissue proper and superimposed tumor is made up of three distinct portions—a neoplastic growth, renal cortex, and an intervening portion made up of fibrous connective and fatty tissue. The neoplastic growth shows a groundwork of connective tissue fibrils, delicate in some parts and dense in others, but arranged in a more or less tubular formation. It possesses large blood vessels with almost no walls. The connective tissue groundwork supports cuboidal, cylindrical, and spindle-shaped cells arranged in a more or less columnar formation. In the center of this portion of the section the tumor cells have undergone necrosis. The kidney cortex shows parenchymatous degeneration in the tubules, with congestion and intertubular hemorrhages. There are areas of small round-cell infiltration, and others showing infiltration with the above-mentioned tumor cells. (See fig. 2.)

The section through a metastatic nodule in the kidney shows a circular area made up of cylindrical, cuboidal, and spindle-shaped cells resting on a light connective tissue stroma arranged in a rather dense tubular formation and surrounded by renal tissue showing compression and infiltration with round cells.

The liver section shows a hypernephroma nodule surrounded by hepatic tissue showing marked fatty degeneration. The nodule is made up of two parts—a central area or necrosis and an outer area consisting of spindle-shaped and cuboidal cells arranged very loosely, with a suggestion of alveolar or columnar formation and having a very scanty connective tissue stroma.

In the lung section is a metastatic nodule surrounded by lung tissue showing serous effusion into the alveoli and passive congestion. The nodule shows two portions—a central area of necrosis and an outer layer made up of cuboidal and spindle-shaped cells resting on very thin connective tissue strands, presenting a suggestion of columnar formation and so loose-meshed as to suggest alveolar tissue. (See fig. 3.)

The principal differences in the microscopical appearance of the various metastases seem to be the differences in the density of the neoplastic tissue.

SURGICAL CONDITIONS OF THE KIDNEY.[1]

By C. G. Smith, Surgeon, United States Navy.

The following cases have been selected to show four entirely different conditions of the kidney requiring operation:

Case 1.—Pyonephrosis. This was a particularly interesting case for the reason that the patient had for some time a pyonephrosis without manifesting grave symptoms. The patient, a warrant officer, appeared to be an individual of tubercular type; tall, very thin and spare, but with good muscular development; normal heart and lungs, chest expansion 3 inches, weight 142 pounds, height 72 inches. History prior to entering the Navy contained nothing of note except that all members of his family were of the same general so-called tubercular type. In 1904 he was rejected for enlistment as being underweight, but this disqualification was waived. In December, 1911, he fell down a ladder leading from the bridge, from which he sustained severe contusions of the back and was for some hours in a state of shock, accompanied by intense abdominal pain. No mention was made in the health record that the urine was examined at this time; probably not, for the presumption is strong, in view of his subsequent history, that had the urine been examined blood would have been detected in it. This injury was simply mentioned in the record, being covered by "contusions" and dismissed by "discharged to duty." The patient, however, had a very vivid recollection of this fall and the intense abdominal pain and tenderness which followed immediately after. He particularly remembers that the place which remained the longest "sore" was in the right loin, which was the site of the eventually diseased kidney.

Another entry on the health record is noted in August, 1913, which states that he had possible gallstone, and that an X-ray was taken which showed no shadow of kidney-stone or indicated any enlargement of the kidney. A few months prior to the patient's admission to the New York Hospital, with a diagnosis of pyone-

[1] Report of four cases operated upon at the Naval Hospital, New York.

phrosis, he had undergone severe hardships. The vessel to which he was attached had been sent to Newfoundland to rescue some fishing schooners from the ice. His vessel while attempting this rescue was also caught in the ice and had to be abandoned, the patient, with the crew, making the best of their way over rough ice to land, and then traveling about 25 miles over rugged country, covered with snow and ice, absolutely without any aid, to the nearest settlement. When he reached the settlement he was completely exhausted, had severe chills with fever, and showed the first and practically only symptoms indicating any disturbance from infection. When admitted to the hospital he complained of general physical exhaustion and pain in the right side: this about six weeks after severe exposure. Examination revealed a large freely movable mass, occupying the right iliac and hypochondriac region, not at all tender, but when moved caused nausea and a feeling of distress, no doubt due to the pulling on peritoneal adhesions about the kidney. The urine contained very little pus, but a cystoscopic examination showed that there was no urine or anything else coming from the right ureter, which would not admit a small ureteral catheter beyond 5 mm., indicating that the ureter was completely occluded.

The left kidney was functioning for both kidneys, the amount excreted in 24 hours being an average of 2,000 c. c. The diagnosis in this case was easy. The large movable mass, which gave a large shadow on the X-ray plate and obliteration of the right ureter, clearly indicated a kidney of which probably nothing remained but a sack containing pus. The patient was first put to bed with absolute rest, given a generous diet, and every means taken to improve his condition before operation. Three weeks' rest had so improved the patient that the operation could be done without danger of a shock, from which it might be feared he would not have the vitality to rally. Under ether-vapor anesthesia a long oblique incision was made from a point located by the outer border of the erector spinæ and angle of the twelfth rib to a point 1½ inches above and internal to the anterior superior spine of the ilium. This incision was longer than generally made, particularly in patients who have a wide iliocostal space, but the pyonephrosis was known to be very large and the object in view was to remove it without rupture and not infect the field of operation.

The kidney was easily exposed and found to be a tense mass, giving the impression of a bladder greatly distended with fluid. Dense adhesions surrounded it, and great care had to be exercised to get a proper line of cleavage and so prevent opening the pus sack. The ureter was first ligated well below the pelvis and then seared with the thermocautery, after which the vessels were transfixed and ligated and the mass removed without rupture. Cigarette

drains were placed down to the ureter and pedicle and the incision closed in layers. Examination of the removed kidney showed that nothing remained of the kidney substance. The blood vessels and ureter were both occluded. The patient made an uneventful recovery and immediately commenced to gain in weight and strength. A quantity of the pus was injected into guinea-pigs. The animals were killed six weeks later, but showed no evidence of tuberculosis.

This case is of interest because the patient had been doing duty for a long time with a serious condition, which gave him no symptoms, certainly not enough to cause him to seek medical advice until he had undergone the excessive hardships after abandoning his vessel in the ice fields. Had he received a blow by fall or otherwise over the pyonephrosis it would most likely have been ruptured, causing general peritonitis, resulting in death. I believe the beginning of this case dates back to 1911, and was due to the fall down the bridge ladder, and the patient at that time probably sustained a dislocation and slight rupture of the kidney. Had the patient been serving on a vessel on which a medical officer was attached undoubtedly he would have sought medical advice sooner, and his condition would have been earlier diagnosed.

Case 2.—Nephrolithiasis. This patient, during the formation of an enormous nephrolith, which practically destroyed the entire parenchyma of the kidney, presented few symptoms until the disease was far advanced, and then sought treatment only for symptoms apparently indicating a mild cystitis. Without cystoscopic examination the true condition would probably have never been diagnosed until it had progressed to the stage of a large pyonephrosis, the patient finally seeking medical assistance for what he would have naturally thought was a tumor growth.

The history of the case indicated that at no time did the patient have the least symptom referable to the kidney; there was no renal colic, local or reflex pain, or even discomfort, and even his cystitis had no reference to kidney trouble, since he antedated it to an attack of gonorrhea he had contracted some years previously.

His health record showed a recent entry as admitted with malaria, but there was no mention that the plasmodium was demonstrated, and in view of subsequent findings the possibility of the "chills and fever" being due to septic absorption from the kidney must be conceded.

When admitted to the hospital this patient appeared to be in the best of health, well nourished, strong, and robust, with hearty appetite, splendid digestion, heart and lungs perfectly normal.

Urethroscopic examination showed a chronic posterior urethritis, with the usual accompanying prostatitis and vesiculitis.

Cystoscopic examination revealed a mild inflammation of the trigone. The left ureter was catheterized and the kidney found to be hypersecreting, but the urine contained a normal amount of urea and chlorids. The right ureter was apparently occluded, but when the catherer was withdrawn after having been inserted for a few millimeters, thick pus followed and continued to flow for some minutes. The left kidney was doing double work, as the average amount of urine passed in 24 hours had been 2,000 c. c.

An opaque catheter was afterward passed into the right ureter and left in place while an X-ray picture was taken, the plate showing a very large stone evidently occupying the entire pelvis of the right kidney.

Although this patient had never experienced the slightest pain or discomfort and there was no impairment of his general health from the condition, the danger to be expected from the presence of such a diseased kidney was apparent, threatening at any time a septicemia or involvement of the healthy kidney by ascending infection from the bladder. The condition was carefully explained and the patient advised to have an operation for the removal of his diseased kidney, to which operation he consented.

Under ether-vapor anesthesia a long oblique incision was made from a point located by the junction of the outer border of the erector spinæ muscle and the angle of the twelfth rib to a point 1½ inches above and internal to the anterior superior spinous process of the ilium. This incision was made larger than the one usually used for the reason that the patient was fat and the iliocostal space comparatively diminished.

The kidney was exposed after the greatest difficulty, being surrounded by markedly thick dense adhesions, the result of long-standing chronic inflammation, which made it exceedingly difficult to get a proper line of cleavage through the perirenal fat. The upper pole could not be delivered without extending the original incision upward and cutting the ligamentum arcuatum in order to allow retraction of the twelfth rib; this is a much better procedure than resecting the rib, as it allows the twelfth rib to be retracted beneath the eleventh, gives just as much room, and does not run the risk of opening the pleural cavity.

When the kidney was finally exposed an enormous stone could be palpated, the kidney itself was soft, and the cortex apparently the site of multiple abscess formation.

The pedicle was transfixed, doubly ligated, and seared by the thermocautery in order to reduce to a minimum the chance of infecting the field of operation.

Just at the moment the kidney was removed the patient sustained a sudden and profound shock, due no doubt to previous manipulation

in separating adhesions and consequent trauma to the adjacent splanchnic plexus. The functions of respiration and circulation had apparently ceased, but artificial respiration with the pulmotor and rapid infusion of normal salt with adrenalin chlorid revived the patient so that the incision could be closed, and he was put in bed still in shock, from which he rallied and had an uneventful convalescence after the first 24 hours, during which period there was complete suppression of urine.

Macroscopically the removed kidney appeared as a large fluctuating mass containing a large branching stone occupying the pelvis and the space left from destruction of tissue. About an inch of parenchyma remained, in which were many small abscesses, and the space not occupied by the stone was filled with pus. Both the renal artery and vein were occluded, and the ureter was thickened and its caliber greatly reduced.

The case was interesting in illustrating as it did the possibility of total kidney destruction by lithiasis without symptoms of any moment indicating such a grave process. In all probability the lith began on a calyx, where it was incarcerated, and so made no attempt to pass via ureter, and as it increased in size the constant irritation of its presence lowered resistance and invited infection, which subsequently destroyed the entire functioning part of the organ.

Case 3.—Nephrolithiasis. Admitted to the hospital with bloody urine, after an attack of acute renal colic, the first and only symptom experienced.

Cystoscopic examination revealed bloody urine flowing from the right ureter; urine from left ureter normal, but catheterization of both ureters showed the left kidney to be slightly hypersecreting. X-ray verified the diagnosis, locating a small stone in the pelvis of the right kidney. The stone was large enough to have existed for some time and had probably been attached to a calyx, as it had not previously made any attempt to pass. The stone, in shape and size, could engage the upper part of the ureter, and, being rough, lacerated, causing colic and bleeding. It never could have passed into the bladder.

This patient was in excellent condition and could be operated upon at once—a thing he particularly desired, to avoid the recurrence of any more such suffering as he had experienced during the previous two days.

Under ether-vapor anesthesia usual oblique incision was made, somewhat shorter than usual, as the patient was thin, had a wide iliocostal space, and the kidney not enlarged. The kidney was easily delivered, but the ureter was in an abnormal position, passing over the lower pole, and was, until palpated, thought to be an adhesion band. The kidney having been delivered through the incision,

a small stone was found in the pelvis and manipulated to the wall of the latter, where it was held by the fingers while an assistant made a small incision upon it and gently removed it with a pair of thumb forceps. A couple of fine catgut sutures were used to close the incision in the pelvis, although this is not necessary, the pelvis readily healing and leaving no urinary fistula. The incision was closed in layers and drainage left for 48 hours. Patient made a rapid and complete recovery.

Case 4.—Pyonephrosis. Has a long history covering a period of nearly two years before being brought to operation. A history of alcohol and venery, headstrong obstinacy, neglecting treatment, and ignoring good advice.

About two years ago had gonorrhea and was treated by a civilian physician. States that he was "cured" in two months; immediately had another attack, "cured" in a month, followed by another attack accompanied by orchitis. These "attacks" of gonorrhea were, of course, exacerbations of an original infection brought on by excesses in alcohol and venery.

First real examination eight months after initial infection of gonorrhea revealed chronic posterior urethritis, with prostatitis, vesiculitis, and mild cystitis.

These conditions were treated by irrigations, dilatations, prostatic massage, and local applications, and were reported as improving, until the patient, in spite of frequent warnings, again became convivial with Bacchus and flirted with Venus. The condition had been in a chronic state for about one year when the first symptoms of pyelonephritis were noted. These symptoms were chills and fever accompanied by pain in the right loin, increased cloudiness of urine, which contained many pus cells and bacteria, giving a pure culture of colon bacillus. This attack lasted about one week, followed by a period of apparently good health except the pathological condition of the urine; then febrile attacks again.

In view of the subsequent history these attacks were undoubtedly due to abscess formation in the kidney.

About this time the patient began to take life seriously, and a note is made in his health record that he had lost his antagonistic attitude and was cooperating with the medical officer.

About 16 months from the date of his initial gonorrhea he was admitted to the New York Hospital. Cystoscopic examination revealed a chronic posterior urethritis with dilated prostatic ducts from which pus was pouring, enlarged vesicles, and a mild grade of cystitis. Catheterized specimens of urine gave normal urine from the left kidney, but from the right the urine was filled with bacteria, pus, and epithilial débris giving a pure culture of an atypical colon bacillus. The patient was put at rest, given a mild

diet consisting of liquids and semisolids, extractives and seasoning being eliminated. An autogenous vaccine of killed colon bacilli was made and injections of 10,000,000 given gradually increased to 200,-000,000 every third day. In addition the patient received irrigations of silver nitrate and prostatic massage.

After two months' treatment there was no improvement and the patient was informed that he had an incurablė infection of the kidney which could not be benefited without nephrectomy, that there was grave danger of the other kidney being infected, and unless he had the kidney removed he would never be fit for sea duty. The patient desired consultation and selected a prominent specialist, who, after exhaustive examinations covering two weeks, reported as follows:

"At no time was pus found coming from the right kidney or ureter. We find the functions of both kidneys normal; that there is no inflammation of the pelvis of the right kidney; *that there are constantly colon bacilli present in the urine from the right kidney;* that there is no incurable disease of the right kidney; that the pus and abnormal ingredients of the urine probably have their origin in the posterior urethra.

"It is my final opinion that there is no pathological condition, acute or chronic, of the right kidney; that there is a bacteriuria which is not dependent upon the condition of the kidney, but is due to a disordered condition of the cecum, with adhesions binding the large intestines; that there is a recurrent cystitis due to chronic inflammation of the prostatic ducts; that the condition is not an incurable one or sufficient to cause chronic invalidism."

With these findings I could in no way agree. The assumption that the bacteriuria was "due to a disordered condition of the cecum, with adhesions binding the large intestines," seemed to me a ***reductio ad absurdum***.

Not being able to agree, another prominent specialist was called in, and, having heard the history, his examination was simple and brief. He obtained catheterized specimens of urine from both kidneys, and it was noted that the right kidney was secreting about three times as rapidly as the left. The analysis of the two specimens should be noted carefully, as it shows the right kidney to be diseased, and the amount of work it was doing without using any of the so-called functional tests. In this connection I should like to state that the phenolpthalein and glucose functional tests have in my experience proved valueless.

Analysis of urine from right kidney: Reaction: Alkaline. Sediment: Very moderate. Nature of sediment: Heavy. Albumin: Marked trace. Urea: 0.5 per cent by weight. Color: Light amber. Odor: Not offensive. Specific gravity: *1.008*. Sugar: Negative. *Chlorids: 0.2* per cent by weight. *Examina-*

tion of sediment: Blood: Some cells. Pus: Small amount. Mucus: None. Casts: Very few hyaline. Bacteria: Moderate bacteriuria, pure growth of colon bacilli on cultures. No tubercle bacilli found. Epithelium: Numerous groups probably from the renal pelvis. Crystalline and amorphous urates and other structures found: None. Analysis of urine from left kidney: Nothing pathological in sediment. *Specific gravity: 1.024. Urea: 2.6 per cent* by weight. Chlorids: 3.5 per cent by weight.

While this consultation was being held the patient had several rigors with rise in temperature to 103° F., pain in the right loin, vomiting, and all symptoms of an acute exacerbation of his chronic condition. Leukocytes 26,800, 80 per cent polys.

The diagnosis was established beyond question, and as the patient showed symptoms of a beginning systemic infection, an immediate operation was advised, to which the patient consented. The usual incision was made, and when the kidney was exposed it was found surrounded by many and dense adhesions, and through its thickened capsule points of fluxation could be felt. The kidney was removed, and during the separation of an adhesion a tear was made in the peritoneum, which was sutured. The incision was closed by layers and drainage left. The patient made a complete recovery, the chills and fever ceasing immediately and urine becoming clear and free from the colon bacilli in a few days. The pathological report on the removed kidney is interesting, showing as it does how close the diagnosis was made.

Histological examination.—The specimen consists of a moderately enlarged kidney measuring 11 by 6 by 4.5 cm., and is covered with several irregularly thickened masses of inflamed and congested perinephritic fat. There is, also, a detached flattened piece of adipose tissue which is likewise congested and inflamed, and measures about 3 mm. in thickness. The capsule of the kidney is of a deep red color, due evidently to widespread subcapsular hemorrhage which has loosened the structure in many places so that it has a "baggy" appearance. The ureter is cut short close to where it joins the pelvis. The cross section here shows considerable thickening and roughening of the pelvic mucosa. The split surface of the kidney shows a diffuse pyelonephritis, with here and there small patches of abscess formation. The cortex appears to be particularly involved and shows a good deal of dark patchy congestion. The anatomical markings are poorly defined. The color, on the whole, is yellowish-gray with reddish areas of hemorrhage. The pelvis is slightly dilated and the calices moderately so. Microscopic examination confirms the gross picture and shows a kidney which has evidently been the seat of repeated attacks of pyelonephritis, with a particularly acute attack associated with suppuration and widespread hemorrhage, probably of toxic origin. The tubules

contain numerous pus cells and epithelial débris. The cap evidences of an old-standing chronic inflammation, being vascular, and infiltrated with numerous inflammatory same picture is present in the perinephritic fat. No e tuberculosis can be found. From the general histopa would seem that the condition is most probably due to ascending infection of the kidney rather than to extensi neighboring focus such as the cecum. The possibility of tion being referable to a gonorrheal urethritis may be co at the same time there is nothing in the pathology which is of this condition. Such a diffuse pyelonephritis is freq to the colon bacillus, which may, however, be a secondary the presence of an obstructive lesion.

Diagnosis: Acute and chronic suppurative pyelonep perinephritis.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

E. THOMPSON and J. A. RANDALL, Surgeons, United States Navy.

DENNIE, C. C., and BUFFORD, J. H. The bacterin treatment of certain chronic pyogenic dermatoses. Boston Med. and Surg. Jour., clxxiii, No. 25, page 910.

The writers conducted a study of the treatment by bacterins of chronic pyogenic dermatoses in which results were poor or failures under other forms of treatment. All external treatment was forbidden and general hygienic conditions and bodily functions were properly regulated at the outset.

Seventy cases (35 acne vulgaris, 21 furunculosis, 14 folliculitis) which were chronic or of over three months' duration were selected. These were divided into two groups, one to receive autogenous, the other stock preparations, both preparations being made by the writers themselves (their method is stated).

The initial dose given was not less than 100,000,000 nor over 400,000,000 killed organisms, the last dose often being 2,000,000,000. The total number of doses rarely exceeded 10, given at from 4 to 10 day intervals, administration being governed by the local reaction at the point of injection, "such as redness, heat, slight edema, and tenderness upon pressure, which appeared within 4 to 12 hours after administration and sometimes remained as long as 48 hours."

The general reaction was usually slight. If improvement reached a standstill a new bacterin was prepared and used. If the case grew worse, smaller doses were given or the treatment was discontinued.

"Sixty-four per cent of all cases treated by bacterins were apparently cured, 20 per cent were benefited, and 16 per cent received no benefit whatever."

Most cases seemed permanently cured, the best results being obtained in furunculosis. "In acne the best results were obtained in the indurated type."

The number of times the various organisms were found were *Staphylococcus albus* 36, *Staphylococcus aureus* 22, combined 11, *Streptococcus pyogenes* 1.

Autogenous bacterins were superior to stock (except in furunculosis, where no difference was noticed), and should always be given when possible.—(W. E. EATON.)

MACKENZIE, J. The soldier's heart. Brit. Med. Jour., January 22, 1916.

That the trying life of soldiers, exposed to many and varied vicissitudes, should put a strain upon the heart is what we all recognize. This strain inevitably finds out the impaired hearts, whether the impairment gives rise to physical signs of lesions or not. This is well understood, and, in treatment, presents no feature which has not been recognized in civil life. These cases, however, form but a small percentage of those that are actually invalided on account of their hearts. It has long been recognized, particularly since the American Civil War, that there is a form of heart trouble to which soldiers are particularly liable, and which has gone under the name of the "soldier's heart" or the "irritable heart of soldiers."

The salient feature in most cases is that the heart condition can be explained by some previous history. The condition is found in people recovering from an exhausting illness, as typhoid fever or influenza, or after a severe surgical operation. All the phenomena are well marked in people suffering from some slight infection. Also in those who have been subjected to long mental strain without sleep.

The story of the onset varies. Sometimes it is an attack of diarrhea, which persists for a time; sometimes it is after a definite illness, as measles, but most give a history which we can safely surmise as being due to an infection. That is the story of the majority of cases, but there are a number from whom we can get no suspicious history of infection, but where there is an account of a very strenuous life.

To grasp fully how this exhaustion is brought about we must understand the life in the trenches. The story of some of these soldiers is illuminating. One in December, 1914, suffered from appendicitis, and was operated upon. He returned to duty three months after, and in June went to the front. Immediately on arrival he went into the trenches and was there a fortnight. Every night was spent in repairing the damaged parapets. They were constantly being shelled. He never slept at night, and occasionally got a few hours' sleep in the day, often being 24 hours without sleep. One day a shell exploded in the trench, knocking him partly unconscious. On regaining consciousness he stuck to his work for 24 hours, but had to give in, feeling weak and ill with pain over the region of the heart.

The action of toxins produced by bacteria give a distinct group of symptoms even when the presence of the organism is not especially evident.

When people suffering from weakness consequent upon an infection or after an exhausting illness, attempt to walk on the level until they

are conscious of their condition, the sensation by which they perceive their weakness is one of exhaustion or sometimes of giddiness. If they stop, sit, or lie down the sensation speedily disappears. If they attempt a more violent form of effort, as walking quickly or up a hill, or running upstairs, they may be pulled up by breathlessness or palpitation—sensations provoked by heart weakness. It is the sense of exhaustion and its allied sensations, giddiness and faintness, that attract attention, because the mechanism of production is different from that producing the sensation in patients with primary heart failure.

In people suffering from some toxic influence the central nervous system is always affected. This is shown by the sense of feeling ill, by depression, and irritability of temper. There is also evidence ot vasomotor disturbances, as shown by susceptibility of the peripheral circulation—the hands and feet persistently cold, or made so by excitement. There is a persistent overaction of vasomotor influences, as the sense of chilliness that persists after a cold bath; at other times flushes of heat pass over the body, and warmth may tend to overfilling of the peripheral vessels. This is seen in people who faint when standing in a warm room, or who speedily become exhausted or even faint when exertion is made. In these the blood tends to accumulate in the peripheral veins of the limbs and in the large abdominal veins, with consequent anemia of the brain. It is because of this anemia of the brain that the sense of exhaustion and syncope is provoked.

Another distinctive feature which is occasionally present is a sense of discomfort, amounting sometimes to pain even of a severe kind, felt over the region of the heart. The pain may be occasionally provoked by exertion, but more frequently it comes on when the individual is at rest. Its occurrence, not in response to effort, is characteristic of pain due to a poisoned heart, for angina pectoris due to disease in the young occurs when effort is made. While not absolutely diagnostic, the occurrence of pain, when this type of patient is at rest, is strongly suggestive of a toxic condition.

Taking into consideration all the facts, it will be found that the condition from which certain of these soldiers suffer, who are usually understood to have acquired a heart affection, is not, properly speaking, cardiac in origin, but is the outcome of an injury to other systems as well as the heart, such as the central nervous system. Even when we find such marked abnormalities as increased rate, systolic murmur, and an increase in the size of the heart, the cause of these signs ought not to be looked upon as heart disease, but merely as part of the manifestation of general illness.—(E. T.)

28559—16——11

BARBOUR, P. F. **The physics of bronchopneumonia.** South. Med. Jour., February, 1916.

The two important aspects of the physics of bronchopneumonia concern themselves with the respiratory and circulatory systems. However varied the cases may be in their symptomatology, the adequate performance of the lungs and heart will be necessary for the preservation of life. Roughly speaking, the symptoms that are more markedly apparent may be those of the bronchial system in which an interference with respiration will be the most alarming condition. Or the symptoms may be more evidently those of a pneumonia with great toxemia and cardiac failure, or there may be a mixture in varying proportions of these two aspects of the disease. When the inflammation is in the larger tubes the results of the inflammatory action is the formation of mucus, which in part is the outpour of the muciparous glands which lie in the wall of the bronchus and in part is made up of the mucous cells themselves, which are destroyed in the process of the disease and are thrown out into the lumen of the bronchus to be expectorated. This mucus at first is tough and tenacious, and to that extent and in that way interferes with respiration. The large size of the bronchi, however, enables the lungs to inspire through this mucus with little difficulty. But when the inflammation has reached the smaller bronchi and especially the bronchioles the lumen of these is so lessened that a very small amount of the mucus will serve to stop up to a certain extent the bronchiole so that no air can pass through. In addition to the mechanical interference of the mucus there is a spasm of the circular muscular fibers in the wall of the bronchiole. That this spasm does take place is made evident by the characteristic râles of a fine whistling type. If the number of the bronchioles involved is at all great there will be a very noticeable duskiness of the face, even if there is not a distinct cyanosis.

If the abdomen is distended and tympanitic there is great mechanical interference with respiration. There will also be a true nervous reflex through the pneumogastric nerve, altering the regularity of rhythm of the respiratory act. It is highly important that digestion be conserved and the normal functioning of the gastro-intestinal system. This is difficult because of the general disarrangement of the bodily functions, and particularly because of the mucus which is swallowed. Mucus is a promoter of fermentation in the bowel and causes a distention, which in turn hampers the breathing.

The problem in lobar pneumonia is essentially the maintenance of the heart activities, because death comes more frequently from the failure of the heart than from any other source. When we look upon a consolidated lung we can appreciate the burden which has been

put upon the right ventricle. Not only do we contend with an acinus filled with epithelial cells, fibrin, corpuscles, bacteria, but capillaries are swollen and relaxed, the elasticity of the blood vessels as well as of the wall of the acinus is lost. The tissues are edematous and the blood is partially stagnated in the whole lobe if not in a larger area.

But there is an increased demand for oxygen because of the temperature, the fever, and the toxemia. The aerating surface of the lung is diminished by a fourth or more. So that the remaining lobes must overwork in order to supply the increased demand for oxygen, and then the blood which was distributed through the pulmonary arteries must be forced through vessels whose total caliber has been reduced by about one-fourth. The blood pressure in the pulmonary area is raised, and so the recoil of blood in the pulmonary artery accentuates the pulmonary sound. This accentuation is then a measure of the ability of the right ventricle to overcome the increased resistance in the pulmonary circulation. One can measure the extent and degree of that consolidation by estimating the accentuation of that sound. When it becomes feebler one may look for dilation of the right heart, increased area of dullness of the heart, the movement of the apex beat to the left and other signs of a failing heart.—(E. T.)

RIEDER and HESS. **Specific treatment of pneumonia with ethylhydrocuprein.** München. med. Wchnschr., November 9, 1915.

A large number of cases are cited and statistics quoted to prove that this drug has a direct action on the pneumococci. Eighty-one cases were treated with ethylhydrocuprein and 81 without. In the former series the deaths were 12 per cent. In the latter the fatal cases were 17 per cent. Considerable experimentation as to doses was made, and it was found that two decigrams every four hours should not be exceeded. With larger doses great deafness and singing in the ears occur about the same as after large doses of quinin. In addition, however, there are serious eye symptoms at times. There was amaurosis in a number of cases for a day, followed by an amblyopia of several days more. The signs in the eye ground were not constant but were generally congestive—the optic disk being sharply outlined and the vessels, especially the veins, overfilled.

Treatment with ethylhydrocuprein gave good positive results in various ways. In most cases the crisis appeared sooner; sometimes in 24 hours. The entire time of the disease is shortened; the patient feels better and breathes easier.

The temperature is not modified, and the fever runs a usual course. The leukocyte count is also unchanged. It seems important to start the ethylhydrocuprein treatment as early as possible.—(E. T.)

STEPP, W. **The use of the duodenal bucket in search for typhoid bacilli in typhoid convalescents.** München. med. Wchnschr., December 7, 1915.

The decision that convalescents are free from bacilli can only be secured by long bacteriological control. It has been found that some are still carriers after a number of negative cultures from the feces. It is recognized that the usual lingering site of the growing bacilli is the gallbladder. The bacilli are discharged into the duodenum and certainly run a course surrounded by many vicissitudes until the attempt to culture can be made. The overgrowth of colon and many other putrefaction bacilli may cause negative results in stool examination when in reality there were typhoid bacilli discharged from the gallbladder. At irregular periods the typhoid bacilli will successfully pass the handicaps and be voided as viable organisms. For some time, in the clinic at Giessen, the duodenal bucket of Einhorn has been used to withdraw pure bile from the duodenum for bacteriological search. In some cases of convalescents there would be a large growth of bacilli found while a search of the feces would only gives an occasional culture. When, in a particular case, cultures of typhoid bacilli cease to be obtained from the bile it can be said that the disease has entirely disappeared.

There are other interesting data which are incidentally derived from examination of pure bile. Colon bacilli were found to be the usual organisms with occasional growth of *proteus*, and the bile is at times found to be sterile. There was one case in which typhoid bacilli were present in the feces but could not be cultured from the bile. The Widal reaction was also negative. This is called an accidental carrier.—(E. T.)

ANDERS, J. M. **The treatment of myocarditis.** Pennsylvania Med. Jour., January, 1916.

Anders calls attention to the fact that acute myocarditis is often overlooked in syphilis.

"The symptoms of cardiac involvement in syphilis may arise as early as the forepart of the second stage. The spirochetes show a selective activity for the myocardium, and invasion of this organ may be rapid. The functional derangement thus occasioned may be slight, or, indeed, the condition may be entirely latent. In many cases, however, symptoms appear and they may develop acutely, the principal features being arrhythmia (emphasized by Brooks), often accompanied by intermittence, tachycardia, thoracic oppression, and slight dyspnea. In cases in which extensive lesions are present precordial pain with more or less tendency to radiation may be observed. It has been shown that the foregoing grouping of features, if they supervene during the earlier stages of luetic infection, disappear in the course

of a few days as the result of vigorous antisyphilitic treatment, a fact that emphasizes the importance of an early recognition of the condition.

"The details of treatment are important. In my opinion acute syphilitic myocarditis is most successfully met by the alternate use of mercury and salvarsan. The former is to be administered intramuscularly in the form of salicylate, and that vigorously, until the limit of tolerance is found, to be then followed by salvarsan, also exhibited intramuscularly. After an interregnum of four or five days mercury is to be resumed. Wassermann tests should be made at brief intervals until a negative reaction is obtained. I have discussed the syphilitic variety of acute myocarditis at considerable length because of the conviction that it is often overlooked by both clinicians and syphilographers for the reason that it is unsuspected by them."—(J. A. R.)

MENTAL AND NERVOUS DISEASES.

R. SHEEHAN, Passed Assistant Surgeon, United States Navy.

GLUECK, B. **The malingerer. A clinical study.** Internat. Clin., III, Series 25.

Glueck is especially competent to write upon this important criminologic study, as he has had ample opportunity in his experience upon which to base opinions. This article is of particular interest to naval medical officers, as the cases cited include several that are well known to a number of them—James Maher, Howard Hall, and James Hall[1]—all of whom traveled a number of times between naval prison and the Government Hospital for the Insane, with consequent trouble and considerable expense. There is a gradually gained conviction that malingering and actual mental disease are not only not mutually exclusive phenomena in the same individual, but that malingering itself is a form of mental reaction manifested almost exclusively by those of an inferior mental make-up, and cases of pure malingering in normal individuals are rare.

Further, malingering, as well as lying and deceit, far from being a form of conduct deliberately and consciously selected by an individual for the purpose of gaining a certain known end, is in a great majority of instances wholly determined by unconscious motives, by instinctive biologic forces over which the individual has little or no control. This makes differentiation between the genuine and malingered symptoms in a given case very difficult.

In the last analysis, malingering is a special form of lying. It appears to certain individuals as the only possible means of escape from and evasion of a stressful and difficult situation.

---

[1] See page 229 of this issue.

The transition from absolute health to distinct mental disease is never delineated by distinct landmarks but shows any number of intermediary gradations. To state definitely where normality leaves off and disease begins would be impossible. However, legally, no intermediary stages between mental health and mental disease are permitted—an individual must be sane or insane.

In malingering we see the application of deceit and lying to a definite situation. The malingerer aside from being a malingerer is worthless mentally, and this mode of reaction is at times resorted to by individuals who had always been looked upon as being far from incompetent, which proves that under special stress, especially mental stress, men readily sink to a lower cultural level and resort to the defensive means common to this level.

Clinically, malingering is to be considered from three distinct viewpoints:

1. Malingering in the frankly insane;
2. Malingering in those apparently normal mentally; and
3. Malingering in that group of border-line cases which should rightly be looked upon as potentially insane and as constantly converging upon an actual psychosis.

It may be difficult for the lay mind to appreciate that an individual may be suffering from an actual psychosis and at the same time malinger mental systems. The frankly insane at times manifest conduct which, taken by itself, differs in no way from normal conduct, and the so-called normal individual at times exhibits a type of reaction which is essentially of a psychotic nature.

The conclusions which may safely be drawn from the study of malingering as it is manifested in criminal departments of insane hospitals are as follows:

1. The detection of malingering in a given case by no means excludes the presence of a mental disease. The two phenomena are not only not mutually exclusive, but are frequently concomitant manifestations in the same individual.

2. Malingering is a form of mental reaction manifested for the purpose of evading a particularly stressful situation in life, and is resorted to chiefly, if not exclusively, by the mentally abnormal, such as psychopaths, hysterics, and the frankly insane.

3. Malingering and allied traits, viz, lying and deceit, are not always consciously motivated modes of behavior, but are not infrequently determined by motives operative in the subconscious mental life, and accordingly affect to a marked extent the individual's responsibilities for such behavior.

4. The differentiation of the malingered symptoms from the genuine ones is, as a rule, extremely difficult, but great caution is to be exercised in pronouncing a given individual a malingerer.—(R. S.)

HESNOLD, E. Dementia precox and malingering. Arch. de Méd. et de Pharm., No. 41914. Jour. Nerv. and Ment. Dis., xlii and xlix.

Inexperienced and prejudiced observers frequently look upon the foolish conduct of the early schizophrenic as malingering, especially if a medico-legal judgment is required. It is the invariable attitude of the prosecuting attorneys. The early symptoms of dementia precox are such as to lead the practitioner to suppose that his patient is only pretending to be sick. This is well set forth in this recent study on the importance of absurd answers in the diagnosis of insanity.

Patients suffering from dementia precox, just after the first onset, are, he says, as yet so little changed, and their mental powers are so slightly impaired, that it is difficult for the alienist to convince the friends of the patient, and even his medical advisers, that he is not wantonly perverse, but, on the contrary, seriously ill. He cites a case of a man who was much run down owing to incipient tuberculosis, who one day became excited in the barrack room and had to be sent to the hospital, where he soon calmed down, and afterward was generally vague and irrelevant in his replies to questions, and at times incoherent, though occasionally his answers were shrewd and amusing. He could be made to speak more rationally if he was sharply questioned and his slumbering self-control awakened. His friends thought he was shamming and asked his motive, telling him it was not necessary for him to do so in order to get out of the service as he was going to be discharged for tuberculosis anyway. This case was recognized as a beginning precox. He looked strange and haggard and always wore a weak smile. When alone he was uneasy, and agitated when observed. He mimicked the medical officer and could talk brilliantly. He died of tuberculosis, which is a frequent termination of schizophrenia.—(R. S.)

WEISENBURG, T. H., and WORK, P. The distribution of tabetic crises with exhibition of an unusual case. Proceed. Phil. Neuro. Soc., February 26, 1915.

Experience with a large number of tabetics had convinced the speakers that in a comparatively large number of patients tabetic crises had been mistaken for some abdominal surgical condition and subjected to operative intervention. The patient, aged 25, denied luetic infection and had never been treated for syphilis. Two years previously he had begun to complain of nausea and vomiting, this lasting for nine days. Following this he had repeated attacks, as often as weekly, each time having nausea, vomiting, and extreme prostration. One year subsequent to the beginning of attacks he was subjected to an exploratory operation and nothing abnormal was found.

Repeated gastric and roentgen examinations failed to reveal anything, but a neurological examination showed irregular pupils with only a slight diminution of the reaction to light, normal reflexes, no history of pains, but a hyperesthesia to touch and pain in the distribution of the fourth, fifth, sixth, and seventh thoracic roots on both sides. A serum Wassermann was + + + + and the cerebrospinal fluid gave a positive Wassermann but a normal cell count, which is unusual. It is clear from this point that we have to deal with a limited syphilitic irritation of the above roots, and this caused the gastric symptoms, because it is known that they transmit the sympathetic fibers to the stomach.

It is interesting to note the limitations of the specific process, causing a hyperesthesia in the distribution of the fourth, fifth, sixth, seventh, and eighth roots, with consequent nausea and vomiting, with irregular pupils and slow reaction, besides the normal cell count, where an increase would be expected.—(R. S.)

POST, A., and WRIGHT, H. **Notes of a conference on medical and social aspects of syphilis of the nervous system.** Boston Med. and Surg. Jour., December 9, 1915.

This was one of a series of papers presented at a conference on neurosyphilis, held at the Psychopathic Hospital, Boston.

This is only part of what is a general awakening as to the really important place that syphilis occupies in medicine. It is becoming an accepted idea that the attitude toward this disease must change, and that it is incompatible, even with safety, to ignore its presence and keep it cloaked by a foolish prudery, as it must be realized that many cases, maybe half, are innocently acquired.

Post writes that this is the only communicable disease where the community demands that the suffering individuals shall bear the expense of protecting the community. The individual must pay for his own treatment or go without. Smallpox patients are taken care of, also those with diphtheria, immense sums are spent on tuberculosis and proportionately very large amounts in a few cases of leprosy, while syphilis has little or no attention.

Syphilis is perhaps the "only crime" in which it is taken for granted that the individual is guilty socially, morally, and physically. It is always taken that the syphilitic is guilty of some lapse from morality. It must be remembered that innocent infections, in which the primary lesion is in the eyes, fingers, or tonsils, are known, and they are perhaps 8 to 10 per cent of all cases, so that in a thousand cases there are almost 100 innocent infections. Besides these consider those innocently infected in marriage, and the hereditary cases. It may be that 50 per cent is not too large a percentage for the number of innocent syphilitics.

Numerous figures have been given as to the number of syphilitics in the general population. Fournier gave 17 per cent for Paris, Hyde 15 per cent for Chicago. Wright adds that in 2,050 admissions to the hospital, from April 1, 1914, to April 1, 1915, there were 329 syphilitic patients. Of these 164 were transferred to hospitals for the insane and 9 died. Forty and four-tenths per cent had general paresis, cerebrospinal syphilis, tabes and allied diseases, and of these 79 per cent were men. Those diagnosed as manic-depressive psychoses, senile dementia, etc., formed 16.1 per cent of the whole, of which 54 per cent were women. The alcoholic and dementia precox group were next in proportion, each with 11 per cent. In alcoholics males were 54 per cent. In dementia precox females were 64 per cent. There were 9.4 per cent feeble-minded and defective, of which 58 per cent were female. The not-insane group was 8.2 per cent, of which 51.8 per cent were men. The congenital syphilitic group of 3.7 per cent had 75 per cent boys.

It is suggested that public exhibits, clinical meetings, and conferences be held which will bring to the public a general appreciation of the problem of syphilis, which is so vitally related to the family life of the country.—(R. S.)

SURGERY.

A. M. FAUNTLEROY, Surgeon, and E. H. H. OLD, Passed Assistant Surgeon, United States Navy.

ROBERTS, J. B. **A plea for efficiency in the accident ward.** Therap. Digest, xxxi, n. s., No. 9, September, 1915.

Roberts calls attention to the custom of putting young men just out of college in charge of the emergency wards of hospitals, and describes some of the harm which may result from errors of judgment of an individual whose treatment is based on didactic teaching without sufficient practical experience. "Never was a big-game hunter made by reading books on the fauna of Africa, or a 'Captain Courageous' by listening to sailors' yarns on the summer shores of East Gloucester Harbor." An experienced doctor should be present to act as consultant.

Out of his own years of experience Roberts suggests the following treatment for some of the urgent conditions constantly arising in hospital work:

Burns.—In severe burns anesthetize the patient at once with a few drops of chloroform before attempting to remove the clothing or dress the wounds, and give a full dose of morphin hypodermically. While anesthetized bathe the burns with 1 to 1,000 formaldehyd or 1 to 2,000 corrosive sublimate solution, then wash with sterile salt solu-

tion or saturated solution of sodium bicarbonate, and dress with dry sterile gauze.

Wounds.—All wounds should be thoroughly cleaned and sterilized and dressed with dry sterile gauze. If sterilization is difficult, general anesthesia with ether may be used to permit thorough scrubbing with soap and water, followed by an antiseptic solution. If for any reason anesthesia is not deemed wise, a gauze dressing wet with corrosive sublimate 1 to 1,000 or formaldehyd 1 to 500 may be used if the wound is considered imperfectly sterilized. Undiluted benzin, tincture of iodin, or alcohol may be painted over the wound, if preferred, and a dry dressing applied.

Gunshot wounds.—Do not use probe. Sterilize the external wound and surrounding skin with soap and water followed by corrosive sublimate solution 1 to 500 or formaldehyd solution 1 to 300 and apply a large dry sterile dressing.

Crushed limbs.—Never put a tourniquet around the thigh or arm at a considerable distance above the crushed tissues. The bleeding should be controlled at the injured region. * * *

Injuries of the abdomen and pelvis.—Sterilize and dress the patient, but do not use probe. Catheterize patient. Do not give an enema unless it is certain that there is no rupture of intestine or other hollow viscera.

Lacerated wounds of fingers.—Injured fingers should never be amputated simply because the soft parts have been scraped or cut away from the bone. Such fingers may often be made useful members by thrusting them into a pocket made beneath the skin of the abdomen or thigh, and keeping them there with sutures for about two weeks. By such a plastic operation a cutaneous covering can be given to the denuded bones.

Lymphadenitis and lymphangitis.—These conditions * * * are well treated by a thick gauze dressing moistened with a mild antiseptic or aseptic solution and covered with paraffin paper or rubber tissue. * * * If improvement does not follow the continuous application of warmth, moisture, and rest, pus may be suspected, and incision will then be required.

Fractures of the skull and brain injuries.—Elevate head of bed unless shock is great. Do not forget to have bladder emptied. Give enema and active purgatives. Shave head and sterilize wounds of scalp and apply large sterile dressing. If there is suspected fracture of the base of the skull, sterilize the nostrils and external meatuses of the ears and plug with sterile gauze. Examine with finger or probe for fracture of the skull. * * *

Choking or suffocation.—Thrust finger down throat promptly, for often a foreign body or a mass of food will be unexpectedly found there.—(L. W. JOHNSON.)

ANDERSON, H. B. **Appendicitis as a sequel of tonsillitis.** Am. Jour. Med. Sc., cl., No. 4, October, 1915.

In 1893 Kelynack directed attention to the occurrence of appendicitis secondary to tonsillitis. Much experimental and clinical evidence of this association has since been published. Anderson reports several cases of appendicitis following tonsillitis.

In two of the cases symptoms referable to the appendix were latent; there was no fever or increase of pulse rate until the sudden development of fulminating symptoms. In both of the cases a gangrenous appendix was found within 12 hours after the onset of symptoms which might be definitely referred to the appendix. The early pain and tenderness were, in both cases, referred to the epigastric and left hypochondriac regions.

Anderson emphasizes the following points:

1. The importance of bearing in mind the liability of appendicitis to follow acute tonsillitis.

2. The appendicular involvement may be only part of a generalized infection, hence the gravity of such cases is out of proportion to the local symptoms.

3. Such cases tend to be atypical in their clinical course and to develop fulminating symptoms.

4. Chronic tonsillar infections should be kept in view as the possible cause of infections of the appendix.

5. Local tenderness and rigidity may, in rare cases, be absent in the presence of acute appendicitis.—(L. W. JOHNSON.)

ALSOBROOK, J. W. **Gasoline, iodin, and alcohol in surgery.** South. Med. Jour., viii, No. 10, October, 1915.

Alsobrook recommends the use of these agents as they assist in simplifying equipment and technic. Gasoline and benzin usually come from the same can when purchased in the ordinary market, and they have the same effect when applied to the skin to remove oil and fat from the surface and hair follicles. Gasoline is always at hand and is excellent for cleansing wounds made by grease-covered machinery. It dissolves the grease and cleanses the wound better than soap and water and more painlessly than alcohol.

For operative cases he uses no other preparation than a bath the night before. After the patient is placed on the table, any necessary shaving is done, the gasoline being applied at the same time. Care should be used not to apply the gasoline too freely or to allow it to gravitate to tender parts; the excess should be sponged off before it evaporates. Iodin (3.5 per cent) is then applied and allowed to dry for five minutes; a second application of iodin is then made and the operation begun.

This combination is of greatest value in emergency surgery; the wound can be cleaned without scrubbing or causing pain. With gasoline, alcohol, iodin, and the little skin clip, practically all the minor accident cases requiring suture can be disposed of in a few minutes without pain, delay, or infection.

Alcohol is used for emergency sterilization of basins or instruments. A little alcohol is poured on and then a match applied.—(L. W. JOHNSON.)

MERRITT, E. P. **Epididymotomy.** Jour. Am. Med. Assn., September 11, 1915.

The method is described as follows:

The site is prepared as for any surgical operation on the scrotum. The scrotum is grasped on the affected side, as much gentleness being used as is consistent with firmness. Three per cent iodin is applied to the field. A 1 per cent solution of cocain is injected at the lower part of the scrotum, anesthetizing the skin from one-half to 1 inch in length. Then the needle is pushed straight down and a few drops distributed in the globus minor. With a sharp-pointed bistoury, an incision is made along the anesthetized line in the scrotum, and then with care the point of the knife is advanced into the globus minor, and several stabs or punctures are made. A blunt-pointed probe is then pushed along the tracks of the knife, and blind avenues opened up. The wound is then packed with 5 per cent iodoform gauze. No sutures are required. A plain gauze dressing is applied and the scrotum kept well supported.

Merritt claims the following advantages for his technic:

1. Free drainage is secured by incision at the most dependent part.
2. Tension is removed and relief from pain is prompt.
3. It can be performed under local anesthesia in one's office.—(L. W. JOHNSON.)

ROBERTS, J. B. **The treatment of fracture a lost art.** Pennsylvania Med. Jour., November, 1915.

Within about 25 years surgeons have neglected to watch and treat the fractures in hospital wards; hence fractures in private practice have given better results than those taken care of in hospitals. As a result young doctors and interns receive little practical experience in the proper bloodless or nonoperative treatment of these injuries.

Professors in medical schools have similarly failed to lay stress on such fracture treatment and within recent years—about 10—have been inclined to show in clinics operative or bloodletting-fracture treatment and neglected to lay stress on the undoubted value of modern nonoperative treatment.

The art of treating the great majority of fractures successfully by bloodless methods has therefore been lost, and bloodshedding means have gained improper popularity among young surgeons and general practitioners, leading to the development of an "operative addiction" on the part of many because they know no better. This operative furor has been dangerous to the community, unfair to individual patients, and unjust to science. Its unreasonable dogmatism reminds thoughtful men of the shibboleths of Hahnemann and the theoretical medicine of past centuries.

The improved and daily improving methods of nonoperative treatment will give good functional and good anatomical cures in perhaps 80 to 85 per cent of closed, that is subcutaneous, fractures of the extremities; provided that the doctor in attendance has the knowledge, the control, and the facility necessary for efficient service.

Prolonged immobilization of the broken bone with little attention to the soft parts and insufficient traction and countertraction are errors of frequent occurrence in treating closed, the so-called simple fractures.

Operative bloodshedding in treatment of fractures of the extremities has an imperative value in only about 10 or 15 per cent of closed fractures, and probably in a larger per cent of open-air exposed, so-called compound fractures.

The operative "addiction" now fortunately subsiding as a result of numerous calamities and a scientific approach to the study of both methods, has opened the eyes of the profession to its dereliction in the management of fracture patients.

Consequently it is probable that fracture wards will be established in the near future in large general hospitals and patients everywhere will receive better treatment of bone injury. This hoped-for result will occur on the principle of the ecclesiastical axiom that the blood of the martyrs is the seed of the church.

The best fracture service is rendered to the confiding patient by the doctor who is tied to no dogmatic creed in fracture treatment, but who is thoughtful, judicious, and experienced.

A surgeon who has forgotten the names and actions of the chief muscles of the extremities should not undertake to treat a fracture of arm or leg unless he has adopted open operation with direct fixation as his sole method of treating broken bones. If he does not remember the normal shape of the bones and joints involved he is probably incapacitated for successful subcutaneous treatment of bone injuries.

A bloodshedding operation for holding the fragments in position is sometimes imperatively demanded, but it may often be avoided by examination under ether followed by dextrous manipula-

tions at the hands of one who knows the contour of the bare bone and the origins and insertions of the displacing muscles.

Constant resort to operative treatment may be checked by study and adoption of the best nonoperative methods, unless operative habituation has been developed through a series of successful operative cases, undoubtedly possible though often unnecessary.

Recovery of functional usefulness is of greater relative importance than anatomical accuracy of bony reconstruction; both are, however, to be set as a standard to be attained. They may usually be obtained by either indirect or direct fixation, provided that the surgeon is skilled and sedulous in the method he adopts.

Operative fixation through an incision is too dangerous in many fractures to be attempted without the assurance of an aseptic procedure and the proper instruments and surgical skill being available. Fortunately in the majority of fractures in civil life such operative fixation is absolutely unnecessary, and resort to it in a considerable number of cases is unwarranted.

The doctor who denies that light friction of the overlying skin and of the muscles in fractures of the extremities is useful, and who asserts that early slight mobilization of adjacent joints is wrong and frequent careful massage undesirable, has failed to grasp the principles of modern fracture treatment.

The successful treatment of a fractured long bone is a mechanico-physiologic "job" somewhat similar to running an automobile, which some persons never learn to do satisfactorily.—(A. M. F.)

LOWMAN, J. B. **The treatment of complicated fractures and present opinion of operative treatment.** Pennsylvania Med. Jour., November, 1915.

Until a few years ago little was written on the modern and open treatment of fractures. This, no doubt, would have continued had it not been for the important discovery of the X-ray.

The average text-book described fractures in a vague and routine way. Standard splints, all sorts of cumbersome apparatus, pulleys, and weights were used in the reduction and treatment of same. There were so many other branches of surgery that were both spectacular and gratifying to the surgeon that he lost sight of this most important branch, the treatment of fractures, not realizing what careful watching and treatment would do, being satisfied with moderately good results.

After the discovery of the X-ray (which is one of the most dangerous weapons to the surgeon) in the treatment of fractures, we commenced to see what horrible results we were getting from a cosmetic as well as functional point of view. We began to study our fractures to a better advantage, fearing that the cases would fall

into bad hands, with a possibility of malpractice suit staring us in the face. When you see some of the patients in these old cases to this day you feel like sliding around the corner until they pass.

The study of fractures by the X-ray was practically the first step in the more careful consideration and study of fractures. Since then there has been a wave of enthusiasm on the treatment. One has only to pick up each week one of the best medical and surgical journals to find several articles on the modern treatment of fractures. The wave has been so rapid that this branch has almost become a specialty of its own. The next important step was the open method and plating of fractures. After Lane read his paper before the American Medical Association, at Atlantic City, there arose a mania (if I may call it) all over the country for plating fractures. Unfortunately for the operation the majority of surgeons had not studied that very careful technic which bone surgery requires. The technic was the same as that used in ordinary abdominal surgery and many failures were recorded, due not to the operation but to the careless technic.

A study of the plating of fractures, however, has taught us a few things: (1) That in some instances, delayed union is present because of too close approximation and immobilization, inhibiting callus formation; (2) that it produces bone absorption; (3) that it produces infection and necrosis of bone; (4) that compound fractures should never be plated.

Open treatment is indicated in those fractures that can not be reduced properly; in those in which no crepitus is elicited, foreign bodies, such as muscle and fragments of bone intervening between the fragments; in complicated fractures around the joints that can not be reduced. This was a second step in the progress of bone surgery. The next was the bone graft, a method which seems to be far superior to any of the other methods, such as wiring, catgut, kangaroo tendon, nails, ivory pegs, bolts, plates, and other hardware. However, many of these methods have their advantages. We believe that in recent fracture of the shaft, when the condition warrants it, the plating is the ideal method; and if done should be done soon, not waiting to see what the fractures will do, as this makes a much more difficult operation and more liability to delayed union. We believe that in all cases of thighs not properly reduced, the use of the plate is the ideal method. The convalescence is shorter and better functional and cosmetic effect is attained.

In comparison of 25 cases of fracture of the thigh by the closed method with the same number by the open method, we find that 23 of the patients treated by the open method are back again at their usual occupation with a convalescence of six months, while of those treated by the closed method, 20 only worked a short time or did not return to their old positions but obtained lighter work. Out of the

25 plates in thighs, we have had one bad result, due to syphilis. I would like to emphasize the advisability of taking a Wassermann test before operating on all bone cases. In our thigh cases we have not had occasion to remove a plate. The only plates removed were from tibias or from fractures of the forearm where they were close to the surface.

As to delayed union in plating, we have discovered that too perfect approximation prevents osteogenesis by not allowing any movement of the fragments. This is also demonstrated by the too tight application of plaster casts. We know by specimens examined that bone with proper splints and care will unite from almost any angle. I am firmly convinced that plating in some fractures prevents union, as I am now having some patients come back six and seven months afterward with the plate bent and the X-ray showing no union between the fragments whatever.

We believe that in complicated fractures around the joints, where proper reduction can not be made, the open treatment gives the best results, especially in the hip, shoulder, and elbow. The use of bone pegs is the ideal method in all delayed unions, anatomical fractures, false joints, and tubercular conditions, and in all fractures where proper reduction can not be made, hardware being a detriment.

For many years experiments have been going on to prove whether transplants, with or without periosteum, lived, or whether periosteum generated new bone. The argument is an open question to-day, as is was years ago.

In the present day we find McCune, Albee, Davis, Murphy, and many others differing as to whether a transplant acts only as a scaffold to stimulate new growth of bone bridging over osteoblast and stimulating osteogenesis, or whether the bone lives. But we know that transplants of bone, with or without periosteum, can be used. Periosteum only gives limiting membrane to the growth of bone.

Twenty years ago all the textbooks on surgery in amputations spoke of the careful preservation of the periosteum in order to prevent a necrosis. We have never bothered in our amputations about the periosteum, and I have yet to see a case of necrosis from this cause. In fact, many authorities are recommending the sliding off of the periosteum and the destruction of the medullary canal for an inch to prevent the tender stumps.

We find that bone transplanted from one species to another does not grow, but bone transplanted from one person to another grows in about 40 or 50 per cent of the cases. But autogenous bone that is transplanted from the same person grows in about 99½ per cent of cases. We also know that transplants have certain immunity from infection, especially tubercular. The success of bone transplant de-

pends on the technic and thorough understanding of the growth of the bone, so far as we know.

The success of the open treatment of fractures and grafting of bone depends first on the mastery of that very careful technic which bone surgery requires; that is, the proper preparation of the patient and part to be operated upon, the handling of the instruments only with gloved hand, never putting the instrument into wound if the part that goes in has been touched by the hand, using sponges only once and then on holder, the hands never going into the wound under any circumstances, and the careful walling off of the skin.

As to methods of bone graft there are the inlay and the intramedullary. Both of these have their advantages. We must always bear in mind that, in order to get a successful graft, living bone must come in contact with living bone. In many operative cases of delayed union there is lack of proliferation of the cells near and at the end of the bone producing sclerosis. One must always be careful to get the graft beyond this area if he wishes to get a successful union. Lastly, there must be the perfect immobilization of the part for six weeks after. This is a very important step, for, if there is the slightest movement of the graft, it prevents and breaks up the sealing of the osteoblasts and blood vessels.

In conclusion, I would say that the treatment of fractures has been revolutionizing for the past 10 years. The pendulum is swinging back to a more conservative treatment. We have found that the poor results have been due to bad technic and use of plates, prohibiting union; that the ideal method of approximating fractures is with the autogenous bone graft; and that better results are obtained by the open method in fractures around and in the joints that can not be properly reduced.

Discussions: On papers of Drs. Roberts and Lowman.

Dr. P. G. Skillern, jr., Philadelphia: The "keys to success" mentioned by Dr. Roberts, namely, mechanical instincts, anatomic knowledge, and surgical common sense, if faithfully employed will save many patients the suffering of an operative procedure. It is with the greatest regret and disappointment that I have seen surgeons, skilled in other branches of surgical work, base their decision for operation upon the amount of displacement shown by the skiagram. The fact that the amount of displacement is determined merely by the amount of inertia of the vulnerating force is too commonly overlooked. In such cases, all that is needed for reduction is to shift the displaced fragments back into place by judicious employment of the keys to success. Nitrous oxid gas should always be administered to afford the surgeon as well as the patient the best conditions for a complete reduction. After the attempt at reduction a skiagram

should be taken. If the fragments are still unreduced, the cycle of administering gas, reducing, and taking a skiagram should be repeated. It may be necessary to repeat this cycle two, four, or even six times in obstinate cases, but each cycle is harmless, though perhaps slightly inconveniencing to the patient. It is only after such repeated attempts by their failure prove clinically the fracture to be irreducible that operative treatment is indicated. After reduction, a copiously padded and carefully applied fixation dressing should be put on, treating each fracture in an individual, not a routine manner.

Of the methods of operative fixation, that by the use of metal plates is the least desirable, and, if indicated at all, metal fixation is best employed for fresh fractures and not (and Lane himself has emphasized this) for cases of nonunion. For nonunion, by far the best method is the employment of the autogenous bone graft, the use of which has been so ably perfected by Dr. Fred H. Albee, of New York City. It must be remembered that in cases of nonunion of long standing the ends of the bone are sclerosed, so that while a metal plate may give perfect fixation, yet union of the sclerosed ends will not be accomplished. An agent must be employed that is osteoconductive and osteogenetic. Such an agent is the autogenous bone graft. It is osteoconductive because it extends into the nonsclerosed bone beyond the ends and conducts osteogenetic elements down into and across the sclerosed portions, thus insuring firm union in 100 per cent of cases that are free from infection. In the presence of infection even union under these circumstances is usual, but can not be anticipated with the same precision as in the noninfected fracture. The autogenous bone graft can be used with success in compound fractures.

Dr. Edward Martin, Philadelphia: I am in full accord with the dictum that metal plates always delay union and are to be avoided in all but exceptional cases. The statistics studied by Estes show that operative treatment is less frequently required in children than in adults. This in part is due to the fact that in the young a moderate deformity is received; the complications which may have developed and the immediate and remote functional and anatomical disturbances are more quickly overcome than in the adult. In the latter a good union, with moderate and allowable deformity, if the bone be a weight-bearing one, may become on use a crippling and deforming one. Hence, given even a slight angulation of the leg bone, weight-bearing should not be allowed for many months, and, moreover, for his own protection, it is of vital importance that the surgeon have written memoranda and X-ray records of the case on discharge, and evidence that advice against weight-bearing was given.—(A. M. F.)

MARTIN, S. P. **End-results in 242 cases of simple fracture of the femoral shaft.** Surg., Gynec. and Obst., December, 1915.

The article is based on observations made at the Mayo Clinic and includes a very well compiled statistical table of all the 242 cases, notes on each case being made under the following heads: Name, age, sex, date of fracture, location, primary shortening, treatment, duration of extension, bed, chair, crutch, cane, condition at discharge, present condition. In the series there were 43 deaths due to various causes, as pneumonia, shock, senility, delirium tremens, etc.

From a study of the tables the author thought the following conclusions, which are quoted verbatim, were tenable:

1. In children fractures of the shaft of the femur involve mainly the middle third.

2. Ninety per cent of all cases of simple fracture of the shaft of the femur in children are followed by complete recovery.

3. In children at the time of discharge from the hospital (8 weeks) there is no stiffness in the knee.

4. The average period of treatment of children in bed and with crutches, splints, and bandages is two to three months.

5. In adults fractures of the shaft of the femur involve mainly the middle third.

6. Between the ages of 15 years and 25 years there are about 50 per cent of complete recoveries, while after 25 years the permanent disability is proportionate to the age of the patient. Men above 40 years rarely regain strength and activity.

7. In adults in the absence of shortening there may be a lasting weakness of the leg and thigh. Permanent disability is as a rule associated with shortening, and is to an extent proportionate to the degree of shortening.

8. The average time in bed and with crutches, splints, and bandages in adults is eight months.

9. In adults at time of discharge (8 to 10 weeks) there is stiffness of the knee in 100 per cent of cases.

10. Among adult laboring men 90 per cent never become able to perform their regular occupations.

11. Among adult males not of the laboring class the great majority are able to perform their regular occupations.

12. The unsatisfactory results following the weight extension treatment of simple fracture of the femoral shaft in adults suggest that this method is either inadequate in itself or unskillfully applied.

13. Efforts for obtaining better results in adults should be directed to: (*a*) The employment of more weight in procuring extension, in the effort to entirely overcome the deformity; (*b*) early resort to open operation if extension seems inefficient; (*c*) the systematic use

of massage and passive motion continued for months; (*d*) a longer use of crutches than is now customary; (*e*) education of the patient.—(E. H. H. O.)

ROBERTS, J. B. **The artificial periosteum for fixation of shaft fractures.** Ann. Surg., February, 1916.

The author suggests the use of a graft of the fascia lata, taken from the outer aspect of patient's thigh, for providing a new periosteum in those cases of fracture of the shaft where the periosteum is lacerated and ends of fragments separated. He believes the method would prove a marked improvement over plating. So far such experiments have only been made on the cadaver. The work of D. C. Straus in treating experimental fractures in dogs with woven catgut rugs or splints has convinced him of the value of the use of the fascial graft for the purpose instead of catgut.

Operative technic: Broken bone exposed and freed from muscles for two or more inches. Fascial graft, cut from outer aspect of patient's thigh, six or more inches long; one end pointed. Cord of thick catgut or kangaroo tendon is attached to pointed end by tying or suture. The cord is threaded on a large curved needle and thus the graft is passed around the coapted fragments so as to wrap the bone twice or thrice. The edges and ends of graft are fastened by suture. Muscles allowed to fall into place, fascia over muscles sutured and wound closed without drainage. Outside is applied a gypsum-gauze encasement with or without traction, or a simple form of splint used.

The use of fascia may be varied. In oblique fractures two strips may be used at some distance from each other.

Roberts considers that the bloodless method of treating fractures ought to remain the one of choice, but that when operative attack is considered advisable the fascial tube or strap will answer the purpose better than the metal plate for shaft fractures.

A request is made that any cases treated by this method be reported to the author.—(E. H. H. O.)

Talk on syphilis. The Clinics of John B. Murphy, M. D., August, 1915.

In a talk on this subject Dr. Murphy stated that he considered hypodermic injections of sodium cacodylate the best method of treating early syphilis: that recently he had recommended salvarsan, but had returned to the above method. Usually chancres heal within from six to seven days and much faster with sodium cacodylate than with salvarsan; repair being accelerated by putting chrysolate of argyrol over the surface of the sore.

There is no surety as to permanency of the cure, but such is also the case with salvarsan.

When the chancre involves the prepuce the central nervous system is involved much later than when chancre is in the urethra.

When chancre is in the urethra you do not get the pronounced lymphatic infection and adenopathies; the cutaneous eruption is absent; alopecia does not occur. This is because in urethral infection the spirochetes enter the blood stream direct and not through the lymphatics to blood stream. In these cases you get a history of *prolonged, but not profuse*, urethral discharge, and the first symptom noticed is some involvement of the central nervous system.

Murphy's method of administration is: Hypodermic injection of grains two daily, increasing to as high as five grains if no idiosyncrasy to arsenic is shown. This is kept up for two, three, or four weeks, or until external manifestations have entirely disappeared. He uses the preparation marketed in ampules.—(E. H. H. O.)

BECKMAN, E. H. **Correction of depressed fractures of the nose by transplant of cartilage.** Surg., Gynec. and Obst., December, 1915.

Attention is called to the marked disfigurement of the face that often results from even slight deformity as result of primary treatment. When first seen the use of intranasal hard-rubber splint with external splint of sheet lead is at times very valuable. Many of the deformities are due to the nasal bones being forced backward or pushed out laterally, causing broadening of the bridge as well as depression. Various methods of correction have been tried. The commonest has been transplantation of part of tibia.

The author recommends the use of cartilage for this purpose and states that such has been used with much success at the Mayo Clinic. Adult cartilage can be transplanted under same conditions as bone. Its viability is not dependent on its being in contact with other cartilage or bone. It is not necessary to preserve the perichondrium. In one case when the wound was infected the cartilage transplant healed in firmly. Some cases have gone two and one-half years with no change in size of transplant.

Technic of operation.—If nasal bones are widely separated it is best to refracture them and put on lateral splints for several days to narrow the bridge. If there are no breaks in the nasal mucous membrane and circulation is again perfect, the transplant can be made. A portion of the costal cartilage of the seventh rib is used, the cartilage being broad at this point, and a good sized piece can be obtained and still leave costal attachment between ribs and sternum. A wax model of defect is valuable as guide to shaping of the transplant, which can be done with a scalpel.

Incision one-quarter inch is made transversely through skin over nose just between the two inner canthi. With periosteal elevator the skin and subcutaneous tissues are elevated from bone and cartilage down bridge nearly to tip of nose. Separation is not carried laterally more than necessary for size of transplant, otherwise we are liable to have it slipping to the side. The transplant is inserted, and a stitch may be taken through it above to keep it from slipping upward. Incision is closed with horsehair and sealed with cotton and compound tincture of benzoin.

Photographs of two cases are shown to illustrate the excellent results obtained by this method.—(E. H. H. O.)

HYGIENE AND SANITATION.

C. N. FISKE, Surgeon, and R. C. RANSDELL, Passed Assistant Surgeon, United States Navy.

Duration of smallpox immunity conferred by successful vaccination. Weekly Bull., Dept. Health, N. Y. City, October 30, 1915.

In view of "*Changes in Navy Regulations and Naval Instructions, No. 5,*" as affecting I 3211, the following excerpt should be of interest in satisfying inquiries:

There are two means of judging the duration of smallpox immunity conferred by a successful vaccination. The first is through observation of those who, having had a successful vaccination, are later exposed to smallpox, and the second, the duration of immunity to vaccination with vaccine virus.

The following table reports the results of the investigations on the percentage of persons susceptible to vaccine virus at 1, 5, and 10 years after a successful vaccination. The inspectors of the department of health occasionally meet with persons who can be revaccinated successfully at the end of six months.

Percentage of vaccinated persons susceptible to revaccination at 1, 5, and 10 years.

Revaccinated.	Kitasato.	Lescohier.
Years after previous vaccination.	*Per cent success.*	*Per cent success.*
1	14	28
5	51	60
10	89	85

Ninety-nine and nine-tenths per cent of persons who have never been vaccinated will "take" if vaccine is of high potency. Vaccinated persons are susceptible to revaccination before they become susceptible to smallpox.

The rubbing in of vaccine virus is a much more direct inoculation than the breathing in of the infected atmosphere. * * * The pro-

tection of vaccination against smallpox is, therefore, undoubtedly considerably greater than indicated by the figures given above.

The experience in this country during three years, as to the time after vaccination that smallpox developed in those previously successfully vaccinated, is a fairly reliable guide as to the period of immunity. This is presented in the following table, the cases being arranged in two groups, those in which the reports were not carefully verified, and those in which the reports were made only after investigation by officials of the United States Public Health Service.

The following table is a compilation of the United States Public Health reports from June, 1912, to and including June 25, 1915:

Cases reported.	Vaccinated within 7 years preceding attack.	Last vaccination more than 7 years preceding attack.	Never successfully vaccinated.
[1] 18,953	798	1,632	16,523
[2] 1,023	32	129	862
[2] 32	5	18	16
[2] 69	4	13	52
[2] 5,181	38	3,226	1,909
6,312	79	3,386	2,839

[1] These reports are from statements sent to the Public Health authorities.
[2] These reports were made by Public Health officials after personal examination.

In the reports which were not carefully verified only 798 had been vaccinated within seven years, while 1,632 had allowed a longer period to elapse. In the cases which were verified for signs of a successful vaccination only 79 were infected within seven years, while 3,386 were infected at later periods.

The shortest immunity conferred by vaccination in the experience of the department is nine months. In literature there are three cases reported of even shorter duration of immunity, one of one and one-half months, one of four months, and one of six months.

It is well known that an occasional individual responds only slightly to immunizing agents. Fortunately, with smallpox vaccination, this lack of response is never absolute, but the degree of immunity established varies with the individual. The variable period that different individuals retain immunizing substances is also in the tables. This peculiarity is present in all antibodies. The enormous experience now gathered indicates that it is wise for anyone exposed to smallpox to be vaccinated, if a successful vaccination has not been made within nine months. The general population should be vaccinated about every five years when smallpox is at all prevalent; even when the disease is absent it is necessary that all persons be vaccinated in infancy and again in childhood so as to keep the population moderately immune and so prevent a sudden development of an epidemic.—(C. N. F.)

COOK, F. C., HUTCHISON, R. H., and SCALES, F. M. **Further experiments in the destruction of fly larvæ in horse manure.** Bull. Depart. Agric., No. 245, July 20, 1915.

Widespread interest was shown in *Bulletin No. 118*,[1] describing borax treatment of manure which for any reason could not be petrolized or efficiently screened to protect the community from fly infestation, but owing to likelihood of seriously impairing its fertilizing value by carelessness in routine usage further effort has been made to obtain a substance which would be injurious to insects alone. Powdered hellebore seems to satisfy this requirement.

The comparative advantages of borax and hellebore are quoted: "Powdered hellebore, using one-half pound to 10 gallons of water and applying this to 8 bushels of manure, is also an effective larvicide and exerts no injurious action on the fertilizing value of the manure as determined by bacteriological and chemical analyses, and no injurious action on plants has been detected in any of the field tests. Hellebore is used as an insecticide and is obtainable in most cities and agricultural districts. The cost of this treatment is 0.69 cent per bushel of manure.

"While borax may be applied to manure at the foregoing rate and the treated manure may be added to the soil at the rate of 15 tons to the acre without injuring vegetation, nevertheless excessive quantities of borax may be applied to manure through carelessness, and injury to vegetation may in consequence result. In the light of this year's experiments it seems advisable to recommend borax as a larvicide for the treatment of outhouses, refuse piles, and all other places where flies may deposit eggs. However, on account of the possible carelessness previously mentioned, and because large quantities of manure are sometimes used by truck growers, it seems best to guard against possible injury to vegetation by recommending powdered hellebore for the treatment of manure, since no injury can arise from the use of excessive quantities, as it is entirely decomposed in the course of the fermentation of the manure."—(C. N. F.)

BERG, W. N. **Biochemical comparisons between mature beef and immature veal.** Jour. Agric. Research, v, No. 15, 1916.

During the study of the chemical composition of mature beef and of immature veal, no differences between them that are physiologically significant were detected.

In a large number of artificial-digestion experiments immature veal digested as fast as mature beef. The speed of digestion was measured by three different methods.

---

[1] U. S. Naval Medical Bulletin, Oct., 1914, p. 699.

Cats were fed on a diet in which immature veal was the sole source of nitrogen. The young animals grew normally on the diet; the older ones became fat. A pair of cats, after living two-thirds of a year on the diet, produced a litter of healthy young kittens which, after nursing period, continued on the immature-veal diet with excellent growth.

The work indicates that immature veal, when properly prepared, is fit for human food, especially when its deficiencies in fat and possibly in small amounts of undetermined constituents are counterbalanced in the ordinary mixed diet.—(R. C. R.)

REICH, H. W. **On the influence of alcohol on bactericidal properties, phagocytosis, and resistance of human erythrocytes.** Arch. f. Hyg., Band 84, Heft 8, 1915.

The phagocytosis of tubercle bacilli by leukocytes in human serum is not markedly halted by the use of alcohol.

The bactericidal action of normal human blood serum on typhoid bacilli was in the average stronger in abstainers and light or irregular drinkers than among heavy users of alcohol.

Similar results were obtained in observations on phagocytosis.

The resistance of human erythrocytes to hypotonic salt solutions showed itself on the average just so much weaker in proportion to the amount of alcohol used by the subject.

In a few the investigated reactions gave both the best and the worst results in all groups of alcohol users. Alcohol seemed to exercise no governing influence.

The question whether a measured, regular, alcohol consumption influences these reactions does not allow itself to be intelligently answered owing to the lack of amount or uniformity of observation material.—(R. C. R.)

TROPICAL MEDICINE.

E. R. STITT, Medical Director, United States Navy.

ROSS, R. **The treatment of dysentery.** Lancet, London, January 1, 1916.

The author notes that when a student at Netley he was under the instruction of Surg. Gen. McLean, who emphasized the wonderful power of ipecac not only in dysentery, but as a preventive of hepatic abscess. In treatment massive doses of the drug were insisted upon, to be given the last thing at night, following a dose of laudanum. Sir Ronald states that personally he is a convinced believer in the specific value of ipecac. It is interesting to read that ipecac as well as cinchona fell into disrepute at times, owing to inadequate dosage. The use of large doses of ipecac was revived by Balmain, who prescribed doses up to 2 drams.

Ross has used ipecac in all kinds of dysentery, and he is by no means convinced that ipecac is not of value in bacillary as well as in amebic dysentery when consideration is given to the extraordinarily specific effect of ipecac on the mucous membrane of the colon.

In the early days of his service in India they did not use bismuth, calomel, or salines to any extent. In chronic dysentery silver nitrate enemata were the standard means of treatment together with ipecac.

As regards intestinal amebas, Ross early in his tropical experience began to regard not only amebas, but flagellates as well, as injurious to the host.

In a paragraph dealing with emetin it is stated that the drug was first separated by Pelletier in 1817 and used later by Bardsley and Walsh in the treatment of dysentery. The entire credit for its recent introduction is given to Rogers, and no mention is made of the name of Vedder. Ross believes that hypodermic use of emetin affects the amebas at the base of the ulcer, while ipecac by mouth attacks those on the surface of the gut and in the lumen, hence both modes of ipecac treatment are indicated.

Among the forces in the Mediterranean bacillary dysentery prevailed up to last midsummer, but after that amebic dysentery was epidemic in July and August. In October cases of amebic dysentery began to be scarce, possibly due to emetin.

Orders were issued to give emetin to every case of suspicious dysentery without waiting for an etiological diagnosis, as it was recognized that every hour counted in instituting treatment to prevent extension of the amebic infection.

As regards the infection among the European troops it is stated that the cases were most severe, many dying before they reached the base hospitals, while with the Indian troops there was neither the same frequency nor severity, suggesting an immunity for those who had probably suffered from amebiasis in childhood.

In using emetin they gave one injection of 1 grain of emetin hydrochlorid daily, or two injections of one-half grain morning and evening, continuing this daily treatment for 10 days.

There was some suspicion that emetin might have a cumulative action, following unexplainable deaths in a few cases of dysentery. Rogers considers that 15 grains is a fatal dose for an adult.

The results with emetin were remarkable. From 10 to 20 per cent of the cases failed to be cured by emetin, but in most of these failures the treatment had not been instituted early in the infection. This matter of early employment of emetin is a most important one in treatment, as the drug can only destroy the amebas and can not heal the lesions.

Attention is directed to the occurrence of bacillary invasion of lesions set up by the amebas, this secondary infection not being solely due to strains of *B. dysenteriæ*, but to various other organisms as well.

The point is emphasized that amebic ulceration may not declare itself during life in the form of a dysentery. It is very interesting to note that some of these amebic infections were complicated by obstinate diarrheas due to intestinal flagellates.

In a paragraph on the purgative action of sulphates he takes the view that these drugs are absorbed by the stomach and then eliminated by the large intestines, setting up a flushing process from within, thus washing away infectious material, whether amebic or bacillary. It is therefore recommended that the saline treatment be carried out in conjunction with emetin.

In advanced cases the exhausting effects of the salines contraindicated their use.

As regards bacillary dysentery there was quite a disagreement as to the benefits of antidysenteric sera, some medical officers being of the opinion that ordinary horse serum would have been just as useful.

Failing sera, Sir Ronald urged the bismuth treatment of Deeks, consisting of a heaped teaspoonful of bismuth subnitrate in a glass of water three or four times a day. He also favored the use of tannic acid in conjunction with the bismuth, but notes that astringents should not be used until after the specific remedies have had time to take effect.

Collapse is treated by subcutaneous salines containing 10 minims of a 1–1,000 adrenalin solution. He regards opium as an invaluable drug throughout the treatment.

Ross deprecates the use of enemata in the early treatment of dysentery but regards them as indicated later on and especially when the process becomes chronic. He prefers warm and weak solutions of either permanganate or quinin, but notes that protargol has given fairly good results in some of the cases treated. He does not think highly of appendicostomy for either amebic or bacillary dysentery.

Paraffin oils by mouth are considered as valuable adjuncts to treatment, his idea being that the oleaginous stool has an injurious effect on both amebas and bacteria.

As regards diet, Sir Ronald states that after seeing cases both improve and die under liquid diet, bland diet, and ordinary diet, he has become skeptical as to the advantages of any special diet.

Of one thing he seems convinced, and that is that large amounts of fluid diet increase the evacuations and harm the patient. He prefers a comparatively dry but varied diet in running dysenteries.

As prophylactic against the occurrence of a chronic dysentery, or of the much worse hepatic abscess, the author recommends that convalescents receive 1 grain of emetin for three successive days every month for a considerable period, as it is well known that abscess may appear for years after an attack of amebic dysentery.—(E. R. S.)

ROGERS, L. **Further work on the treatment of kala-azar.** Indian Med. Gaz., May, 1915.

In this paper various lines of treatment are discussed under separate paragraphs.

Arsenic was used in different forms of the drug with an idea that its leukocytosis-producing effect might operate favorably in a disease where the decrease of leukocytes was so pronounced. Liquor arsenicalis by the mouth had a tendency to produce diarrhea, a most serious complication in kala-azar.

Soamin and salvarsan seemed to have little if any value.

With the idea that sodium nucleate might increase the leukocytes this drug was injected subcutaneously in from 0.1 to 0.4 gram dissolved in water to make a 5 per cent solution. The injections were very painful, and the drug had no effect in increasing the leukocytes.

Rogers next tried the mixed bacterial toxins known as phylacogen, but only noted severe constitutional reactions with negative results as to improvement in the cases or increase in leukocytes.

Killed vaccines of staphylococci, up to 500,000,000, gave somewhat encouraging results, with improvement in some cases and an increase of leukocytes to normal in two cases.

Living sensitized cultures of stapylococci were next tried but had no advantage over the dead organisms and were not without danger.

In using speen-substance tabloids he observed rather marked improvement in some of the cases, the spleen diminishing in size, the temperature decreasing, and the leukocytes increasing. He regards this treatment as of distinct value.

The author next tried the effects of alkalis.

As a result of testing the blood, he had found that the blood of kala-azar patients was much reduced in alkalinity and the alkali treatment was thus suggested. The treatment with intravenous injections of sodium bicarbonate did not give decisive effects, but with alkali by mouth he obtained quite encouraging results. On the whole this treatment gave more encouraging results than did any of the others noted in this paper.

NOTE.—In a subsequent article in the same journal (October, 1915) Rogers gives the results of his treatment of kala-azar with antimony.

He first used tartar emetic intravenously in a 2 per cent solution, starting with 2 c. c. and gradually increasing to 10 c. c., as long as nausea and epigastric pain were not produced. Of 13 cases treated in this way, 6 were greatly improved and 2 decidedly so.

Recently Rogers has been trying an ointment of 5 per cent finely divided metallic antimony for children with kala-azar apparently with some success.—(E. R. S.)

LANE, C. **The treatment of hookworm disease.** Indian Med. Gaz., July, 1915.

The author discusses four methods of treatment from the standpoint of the clinical effect and that of efficiency. He also considers these treatments from the side of relative expense, but as such estimates are based on war prices of drugs, it would seem better to leave this out of consideration for the present.

As regards the eucalyptol treatment, Lane states that in his experience it has given gratifying success. He has not observed the untoward symptoms of dyspnea and syncope noted by other authorities. It may be stated that Lane gives the dose in two portions, the second half taken one half an hour after the first, so that, instead of giving 2 c. c. eucalyptol and 3 c. c. of chloroform with an ounce of castor oil at one time, he divides the amount, thus lessening the danger from the chloroform, which while rapidly absorbed is equally rapidly excreted by the lungs.

With eucalyptol, 38 per cent of the worms were expelled as the result of a single treatment.

In connection with the beta-naphthol treatment he notes that it is apt to produce a serious condition of the kidneys, provided these organs are not perfectly sound. It is noted that in severe ancylostomiasis we often have a fatty degeneration of the kidneys, hence the peculiar danger of the drug.

With beta-naphthol 68 per cent of the worms were expelled with a single treatment, which consisted of 10 grains of the drug at 6, 7 and 8 a. m., followed by a dose of Epsom salts at 10 a. m.

The thymol treatment was 20 grains of the drug at 6, 7 and 8 a. m. (60 grains in all) followed by a dose of Epsom salts at 10 a. m.

This treatment may cause dizziness and depression as well as kidney and alimentary tract irritation. It therefore should not be used in gastritis, dysentery, heart disease or when the urine shows albumin.

With thymol 83 per cent of the worms were expelled with a single treatment.

For the chenopodiol treatment he gives 15 minims of oil of chenopodium on sugar at 6, 8 and 10 a. m., followed by a dose of castor oil at noon.

He recommends that, if the kidneys be not perfectly sound, the dose of chenopodiol be reduced. With this treatment 91 per cent of the worms were expelled with a single treatment.

From the above it will be noted that the chenopodiol treatment is the most efficacious.—(E. R. S.)

PATHOLOGY, BACTERIOLOGY, AND ANIMAL PARASITOLOGY.

C. S. BUTLER, Surgeon, and R. H. LANING, Passed Assistant Surgeon, United States Navy.

BUNTING, C. H., and YATES, J. L. **Bacteriological results in chronic leukemia and in pseudoleukemia.** Bull. Johns Hopkins Hosp., November, 1915.

The authors report the result of cultures made from axillary lymphatic glands in a case of chronic lymphatic leukemia. They obtained a pure culture of a diphtheroid organism, on one of six tubes showing growth. At first growth was only on the gland substance but later on the Loeffler's medium. Morphologically it was identical with the strains isolated from Hodgkin's disease.

Another case presented clinically the appearance of a case of acute leukemia, in the character of the mouth lesions, in the enlargement of certain cervical glands, and in the presence of cutaneous and subcutaneous tumors. However, blood counts were only 5,000 to 6,000. Histologically, a skin nodule showed the features of acute leukemia or lymphosarcoma.

Cultures obtained by Dr. R. H. Jackson showed a diphtheroid organism like that from the case of chronic lymphatic leukemia, except that it grew somewhat more readily on artificial media.

The writers believe that, "The etiogical relationship of this diphtheroid described must perhaps remain for a time *sub judice*. The occurrence of similar organisms in a variety of diseases would certainly seem to be an argument against their etiological importance. However, it is our experience thus far that this type of organism is found with readiness only in one general group of apparently related diseases, and in these without fail with good technic. In this group we would include Hodgkin's disease, the lymphogenous leukemias, the pseudoleukemias (lymphosarcoma), Banti's disease, and probably also mycosis fungoides."—(G. F. CLARK.)

JOBLING, J. W., EGGSTEIN, A. A., and PETERSEN, W. **The acceleration of esterase action. Studies on ferment action.** Jour. Exper. Med., December 1, 1915.

The importance of ferments in relation to immunity, and the possibility of increasing the ferments or bringing about greater activity of those present, is the basis of this study.

From their previous work, the authors believe that antiferments of the serum, of the cells of the body, and of bacterial cells, are composed of unsaturated fatty acids, probably in the form of esters, and that oxidation renders them inactive. Owing to their insolubility dissociation might also render them inactive as antiferments. Esterase can cause such dissociation, and is therefore of importance. The removal of protective esters from bacteria may render them more susceptible to the action of proteolytic ferments, which by hydrolysis can render the toxic substance nontoxic.

Tissue esterase was prepared from finely divided dogs' livers, by extraction with glycerin; filtration, precipitation by ammonium sulphate, and dialysis.

One c. c. of esterase, when incubated with 1 c. c. of ethyl butyrate for four hours, usually gave an acidity equal to 7 c. c. of $\frac{N}{100}$ sodium hydrate. Accelerating substances added to the esterase and ethyl butyrate increased the titration of acid from 7 c. c. $\frac{N}{100}$ sodium hydrate to 40 c. c. or more. Sodium citrate was found to be the most active agent.

Experiments on animals by intravenous and intraperitoneal injections of sodium citrate did not cause definite increase of serum esterase.—(G. F. CLARK.)

JOHNSON, J. P., and MILNE, A. J. **Combined preventive inoculation against typhoid and paratyphoid fever and bacillary dysentery.** Brit. Med. Jour., January 15, 1916.

It has been shown by many workers that the use of mixed bacterial vaccines is sound.

The authors amplified previous work on this subject so as to include protection not only against typhoid and paratyphoid organisms but also against the organisms of bacillary dysentery.

To offset the intense toxicity of *B. dysenteriæ* the authors took advantage of the fact pointed out by Broughton-Alcock that vaccines subjected to heated normal serum are robbed of toxicity without damage to antigenic properties. The vaccine is, however, prepared from the several types of *B. dysenteriæ* which have been subjected to a heated polyvalent dysentery serum. In all they have tried about 150 inoculations, using a small series of controls.

Their conclusions are as follows:

1. Inoculations with untreated dysentery vaccine, either alone or combined with a typhoid+paratyphoid vaccine, is not under any circumstances justified owing to the severity and duration of the local reaction.

2. The use of a typhoid + paratyphoid vaccine combined with sensitized dysentery vaccine is a practical proposition from a military point of view and can be employed in doses sufficiently large to produce a satisfactory immunity, while the local reaction is practically in all cases slight. Such a vaccine should contain in 1 c. c. *B. typhosus*, *B. paratyphosus A*, and *B. paratyphosus B*,—500,000,000 in a ration of 2, 1, 1,—plus *B. dysenteriæ* (sensitized) 250,000,000. A dose of 1 c. c. is recommended as a first inoculation, followed by a second inoculation of the same amount after an interval of seven or eight days. A third inoculation may be made, but is not essential. It is important that the inoculations should be made in subcutaneous tissue over muscle. In our experience the pectoral region is convenient. In order to insure accurate doses, a 1 c. c. syringe with a moderately fine needle should be used.

3. Complete sensitization of dysentery vaccine produces marked reduction in local reaction, and general reaction is very exceptional.

4. *Agglutination reactions.*—After one inoculation of a combined untreated vaccine, specific agglutinins are found in the blood after an interval of 9 to 14 days for each of the four organisms present. Immunity is therefore rapidly produced, and it would appear that complete sensitization of the dysentery organisms not only reduces the local reaction, but produces a much more rapid and satisfactory immunization, owing to the more complete disintegration of the treated organisms and the absence of any mechanical obstruction (such as localized fibrosis) to the blood supply of the affected area.

5. We anticipate that even a further reduction in local reaction will be obtained on the employment of a mixed vaccine prepared from typhoid, paratyphoid A, paratyphoid B, and dysentery organisms, completely sensitized with their respective antiserums.—(C. S. B.)

OLMSTEAD, M. P., and POVITZKY, O. R. **The complement-fixation reactions of the Bordet-Gengou bacillus.** Jour. Med. Research, January, 1916.

Consideration is given to the relationship between atypical strains of *B. pertussis* and between *B. pertussis* and *B. influenzæ* as shown by fixation tests. Previous literature upon the same subject is referred to and the object of the investigation stated to be to confirm some of the previous findings, and determine the interrelationship of various strains of the Bordet-Gengou organism.

The strains used are described and methods of identification indicated. The technic of making and standardizing antigens and of producing the immune sera are described.

Table 1 gives the complement-fixing value of immune rabbit serum after various inoculations with live cultures of Bordet-Gengou, atypical Bordet-Gengou, and influenza bacilli.

Table 2 gives results of antigen titrations, and Table 3 that of serum titrations.

The authors' conclusions are as follows:

1. The separation by morphological and cultural characteristics of the typical Bordet-Gengou bacillus from the influenza bacillus has been confirmed by complement-fixation tests.

2. *B. pertussis* is somewhat related in its complement-fixation characteristics to at least two strains of the influenza bacillus and to at least two atypical *pertussis* strains, but is differentiable.

3. Immune serums of Bordet-Gengou strains have been found to cross-fix with antigens of Bordet-Gengou strains only. Immune serums of some influenza strains have cross-fixed with Bordet-Gengou as well as with influenza strains.

4. Twelve strains of *B. pertussis* isolated in this laboratory from cases of pertussis have given complement-fixation reactions similar to each other and similar to the two strains obtained from other laboratories and may be considered practically homologous.

5. By the use of more highly specific antigens or larger amounts of complement and hemolytic amboceptor than those ordinarily employed, a differentiation of individual strains of *B. pertussis* may be possible.

6. To obtain immune serum of high complement-fixing antibody content, four intraperitoneal inoculations of a living culture of *B. pertussis* or *B. influenzæ* may be sufficient; nine or more inoculations are advisable, as a decided rise in the antibody-content curve occurs after nine inoculations.—(C. S. B.)

DEAN, H. R., and MOUAT, T. B. **The bacteria of gangrenous wounds.** Brit. Med. Jour., January 15, 1916.

This timely paper deals in a masterful way with the bacteriology of gangrenous wounds. The procedure followed in their cases was the study of film preparations from the wounds or necrotic material taken from them, and the isolation of anaerobic and air-growing organisms from the wounds with subsequent identification. These were then tried out for their cultural and staining reactions and their effects upon inoculation into animals.

Of the anaerobic organisms *B. aerogenes capsulatus*, *B. edematis maligni* and *B. tetani* were the principal ones. Of aerobic ones streptococci, staphylococci, *B. proteus*, *B. coli*, and others were found. Association of *B. aerogenes capsulatus* and streptococcus was almost constant.

Association of more than one anaerobe was often found. In such cases in the anaerobic cultivation *B. aerogenes capsulatus* appears first, *B. edematis maligni* after three or four days and, lastly, per-

haps after 10 days, *B. tetani.* Most of the 18 wounds studied contained both *B. aerogenes capsulatus* and *B. edematis maligni.* In only three cases did death occur and in only four was there gas formation in the tissues. It is therefore probable that neither organism is a true parasite, *i. e.*, can multiply in living tissue. In blood clot, dead tissue, and in foreign bodies they are capable of multiplication and thus produce poisonous substances (probably ammonium salts) which damage the surrounding tissues and permit of extension of the growth.

The microscopical method of diagnosis (i. e., from films) is uncertain, as both *B. aerogenes capsulatus* and *B. edematis* give indistinguishable forms. *B. tetani* in pure culture may, indeed, give many forms which are in no way characteristic.

The authors summarize their results in the following paragraphs:

1. The series comprises 18 cases of gangrenous wounds, of which 3 were fatal. Included in this total are 4 cases of tetanus (1 of which was fatal) and 4 cases of gas gangrene (2 of which were fatal). Of the 18 cases *B. aerogenes capsulatus* was present in 13.

2. *B. aerogenes capsulatus* and *B. edematis maligni* are apparently possessed of powerful enzymes. The former is peculiarly able to attack carbohydrates, the latter proteins. Dorset's egg medium is an admirable medium for both microorganisms.

3. The shape, size, staining reactions, and capacity for spore formation of these bacilli are profoundly influenced by the nature of the culture medium.

4. On Dorset's egg medium the majority of the bacilli are typical in shape, uniform in size, and Gram-positive. On media which contain a carbohydrate, from which the bacilli can form acid, growth is at first rapid and vigorous, but after a few days the bacilli become atypical in appearance, vary greatly in size, and the majority are Gram-negative.

5. *B. aerogenes capsulatus* forms spores on Dorset's egg medium and inspissated serum, but not on media in which an acid reaction is produced. *B. edematis maligni* forms spores less readily in acid media.

6. The presence of *B. aerogenes capsulatus* and *B. edematis maligni* is not necessarily associated with the development of gas in the tissues.

7. *B. edematis maligni* and *B. aerogenes capsulatus* are essentially saprophytes. They have little or no power to multiply in living tissue. In dead tissue they grow rapidly and produce poisonous substances, by which the adjacent living tissue is destroyed and rendered a suitable medium for the further multiplication of these bacilli.

8. *B. tetani* was not found in films made from the discharge in any one of the six cases of this series in which it was present.

9. The recognition of *B. tetani* by purely microscopical methods is complicated by the fact that slender Gram-positive rods bearing an absolutely terminal spore may be occasionally found in pure cultures of *B. edematis maligni* and *B. aerogenes capsulatus*. Moreover, pure cultures of tetanus bacilli, especially cultures on egg medium, contain many atypical forms.

10. If broth is inoculated with material from the wound in a case of tetanus and incubated under anaerobic conditions, the presence of *B. tetani* can be satisfactorily demonstrated by animal inoculation. Such a broth culture should be examined at intervals, and two or three weeks may elapse before *B. tetani* can be demonstrated.

11. The presence of *B. tetani* was demonstrated in the discharge from the wounds of two patients who did not develop signs of tetanus. Both had received prophylactic injections of antitetanus serum.

12. The discovery of *B. tetani* in the wounds of a patient who had not developed tetanus would obviously be an indication for one or more prophylactic injections of antitetanic serum. But the practical utility of such a procedure is limited by the difficulty and delay which attend the bacteriological recognition of this bacillus. Now, *B. tetani* belongs to the same group of anaerobic bacteria as *B. aerogenes capsulatus* and *B. edematis maligni*. All three probably have a common source, and the conditions favorable to their growth within a wound are probably identical. The demonstration of either *B. edematis maligni* or *B. aerogenes capsulatus* is a relatively simple matter and does not involve much delay. The discovery of either of these bacilli might with advantage be followed by a prophylactic injection of antitetanic serum.—(C. S. B.)

KOLMER, J. A., and TRIST, M. E. **Studies in nonspecific complement fixation.** Jour. Infect. Dis., January, 1916.

The authors in their studies on rabbit sera make the following conclusions: "Fresh active sera from normal rabbits in doses of 0.1 c. c. showed nonspecific complement fixation with lipoidal extracts in 5–15 per cent of sera.

"When these same sera were inactivated by heating them in a water bath at 55–56° C. for 30 minutes, complement fixation occurred in 38–49 per cent of sera.

"With both active and inactivated sera the highest percentage of positive reactions was observed when alcoholic extracts of heart muscle reinforced with cholesterin were used as antigens: alcoholic

extracts of syphilitic liver gave the second highest, and an extract of acetone-insoluble lipoids gave the lowest, percentage of positive reactions.

"With bacterial antigens of staphylococci and colon and typhoid bacilli, fresh, active rabbit sera showed some degree of complement fixation in 31–42 per cent of instances; when these sera were inactivated, positive reactions occurred in 51–62 per cent.

"The degree of complement fixation with normal rabbit serum and lipoidal and bacterial antigens is usually moderate or slight, as about 50–85 per cent of reactions show 50 per cent or less, inhibition of hemolysis.

"The reacting state of a rabbit's serum when the animal is on an average diet is usually constant, in that 80 per cent of our animals reacted persistently positively when examined at intervals of three days to a month.

"It is to be emphasized that when rabbits are employed for experimental studies with a view to using their sera for complement-fixation tests their sera should be tested one or more times before inoculation, preferably with the particular antigen to be used, and only those selected that react negatively."

In their studies on dog sera they state as follows: "Dog serum in both an active or fresh condition and after heating or inactivation is capable of absorbing complement, in a relatively large percentage of instances, with various lipoidal and bacterial antigens.

"The animals tested were those ordinarily met with in the kennels, and while a number of these have or probably had had distemper, most of them, tested within a short time after admission, showed no evidences of this infection. In this series no differences in complement fixation with the antigens employed were noted between the sera of normal dogs and the sera of those showing the symptoms of distemper, and the results have been ascribed to a process of non-specific complement fixation or absorption.

"With heated sera from normal dogs it was the exception rather than the rule to observe a negative reaction with these antigens, and this has had a very important bearing upon the question of complement-fixation tests with dog serum for diagnostic purposes, as in the complement-fixation test for distemper.

"Among the lipoidal extracts, the highest percentage of positive reactions occurred with alcoholic extract of human heart reenforced with cholesterin; next in the order of yielding positive reactions came an alcoholic extract of syphilitic liver, while an extract of acetone-insoluble lipoids yielded the lowest percentage of positive reactions. These relations held with both active and inactivated sera, and the results are similar to those observed with normal rabbit serum. It would appear that the presence of cholesterin in an

extract increases the percentage of positive reactions, as it undoubtedly enhances the antigenic sensitiveness of any tissue extract for the syphilis reagin in the Wassermann reaction.

"Fresh, active dog serum in dose of 0.05 c. c. yielded the highest percentage of positive reactions with both lipoidal and bacterial antigens, while with doses of 0.2 and 0.4 c. c. of serum no reactions occurred with the lipoidal extracts, and with the bacterial antigens the tendency for complement fixation was greatly reduced. It is probable that native hemolytic complement and antisheep hemolysin present in the dog sera were partly responsible for these results and obscured lesser degrees of complement absorption.

"Heating dog serum at 55° C. for 30 minutes greatly increases the tendency toward nonspecific complement fixation, not only with lipoidal, but also with the bacterial antigens. The tendency toward absorption or fixation of complement and the percentage of positive reactions increase with increasing doses of serum, except when 0.4 c. c. serum is used, when the tendency somewhat diminishes as a result of some degree of a masking of complement fixation by the presence of natural or normal antisheep hemolysin in dog serum.

"The degree or amount of complement absorption with lipoidal extracts is usually moderate or slight, as measured by the method employed. With the cholesterinized alcoholic extract of heart and alcoholic extract of syphilitic liver more complement was absorbed than with the extract of acetone-insoluble lipoids; the bacterial antigens showed a greater degree of complement absorption inasmuch as the reactions were more frequently + + + + and + + +, than + + or less."—(R. H. L.)

LEIPER, R. T. **Report on the results of the bilharzia mission in Egypt, 1915.** Jour. Roy. Army Med. Corps, July, August, September, 1915.

In this extensive article which came out in three installments the author gives an exhaustive account of the discovery of the intermediate stage of development in the life cycle of *Schistosoma hematobium*, the characteristics of these forms, the intermediate hosts, and the etiological and hygienic facts connected with the discovery. Gastropod molluscs of various species were found to be intermediate hosts.

The intermediate development in the life cycle of the fluke was found to go through the stages of free-swimming miracidium, sporocyst, daughter sporocyst, and cercaria. The last becomes free swimming and is the infective stage. The sporocysts develop in a gastropod mollusc and throw off the cercariæ into the water in showers. The cercariæ may infect either through the mucous membrane or the skin.

The methods of prophylaxis of the disease depend on the destruction of the intermediate host, on the destruction of the miracidium and cercaria, and on rendering access to the skin and mucous membrane by the cercariæ impossible. All these points, besides many others, are discussed in this paper.—(R. H. L.)

BLAKE, F. G. **The etiology of rat-bite fever.** Jour. Exper. Med., January, 1916.

As a result of his investigations the author makes the following conclusions:

"1. Rat-bite fever is a specific infectious disease following the bite of a rat. It occurs in Asia, Europe, and America.

"2. The etiological organism is *Streptothrix muris ratti*, first described by Schottmüller in 1914. His observation is confirmed by the isolation of an identical streptothrix in the case here reported.

"3. Invasion of the blood stream by *Streptothrix muris ratti* occurs in rat-bite fever.

"4. The case here reported developed a powerful agglutinin for *S. muris ratti*.

"5. Pathological changes occur in the myocardium, kidneys, liver, and adrenals, showing areas of degeneration and infiltration with polynuclear leukocytes, lymphocytes, plasma cells, and endothelial cells.

"6. Ulcerative endocarditis may occur in rat-bite fever and be caused by the *S. muris ratti*."—(R. H. L.)

EYE, EAR, NOSE, AND THROAT.

E. J. GROW, Surgeon, and G. B. TRIBLE, Passed Assistant Surgeon, United States Navy.

DAVIS, L. J. **Ethmoiditis. Its varied effects and their probable prevention; or, when fully established, their possible cure.** Pennsylvania Med. Jour., xix, No. 3.

The most frequent conditions affecting the ethmoid structures are: (1) Engorgement of the mucous membrane, temporary or chronic, within or surrounding the cells; (2) mechanical irritation, from marked variations in atmospheric temperatures, dryness or moisture, and from inhalation of chemical irritants; (3) infections, acute or chronic; (4) hypertrophy or hyperplasia of membranous structures, middle turbinates, or any adjacent structures; (5) obliteration or occlusion of ostia, ducts, or the cells themselves; (6) inflammations, active and recurrent, or low grade and continuous; (7) deflected or irregular septa; spurs or ridges; (8) traumatic injuries; (9) adhesions from inflammatory processes or accidental excoriations during

operation; (10) polypi; (11) bony necrosis; (12) malignancy; (13) syphilis; (14) tuberculosis.

Treatment.—(1) Constitutional depletion of the lower bowel by means of hepatic and saline purging, restricted diet, administration of 1/1000 gr. atropin every hour for 10 doses.

Local measures.—(1) Application of mild astringents; weak solutions of cocain; weak solutions of adrenalin; argyrol, 10 per cent; silver nitrate, 1 per cent; menthol, 1 gr. to the oz.; normal salt solution. (2) Aspiration, irrigations, hyperemia. (3) Employment of bacterial vaccines (stock combined vaccines). All local medications are applied directly to the ethmoidal area by means of pledgets of cotton.

Surgical measures.—Conservatism is the best surgical practice. Resection of the middle turbinate is frequently needed, but indiscriminate sacrifice of this organ is not to be encouraged, but in blocked ethmoiditis the position of the middle turbinate renders it the chief interfering factor.—(G. B. T.)

WINSLOW, J. R. **Obstruction of the posterior nasal orifice (choanae).** Maryland Med. Jour., lviii, No. 12.

This condition if congenital results from developmental anomalies, and is characterized by the formation of a partition which most often consists of a thin plate of bone; it may be mixed, or entirely membranous.

In the new born, if the obstruction is bilateral, mouth breathing must be acquired or asphyxiation occurs. In older children and adults, the usual symptoms of obstruction exist, and since there is an inability to blow the secretions from the obstructed side, there is a constant discharge.

The only treatment is operative removal of the obstruction as far as possible. In children asphyxia can be averted by pressure downward on the lower jaw and chin, and pulling the tongue forward.—(G. B. T.)

HOLMES, E. M. **The space sense and the labyrinth.** Maine Med. Jour., vi, No. 5.

The sense of position in space is rendered possible by an association of several organs, of which the labyrinth is the most important. The eyes, the skeleton and muscles, the viscera, and the nerves and ganglia leading from them are additional factors. The central station is the cerebellum. In producing nystagmus the impulses from the labyrinth pass through the vestibular nerve to the ventrocaudal nucleus of Deiter, and through the posterior fasiculi, the pons

and midbrain, terminating about the nuclei of the third, fourth, and eighth cranial nerves, and through these nerves to the ocular muscles.

Producing nystagmus by chilling the internal ear, if the right arm is extended horizontally it deviates downward. The left arm if extended horizontally deviates upward. Inclining the head forward about 90°, internal ear chilled, both arms will deviate to right, if the head is curved backward 90° both arms deviate upward.

In diseased conditions of a labyrinth the patient tends to fall toward the diseased side, and when lying down, lies on the sound side.

Later in labyrinthine disease there is a certain compensation established by the other space organs, and the symptoms are less marked.—(G. B. T.)

MURPHY, J. W. **Acute middle-ear inflammation.** Lancet-Clinic, cxiv, No. 19.

This condition is most frequently met with in children before the fifteenth year, following nasal or nasopharyngeal conditions which lead to an inflammation of the eustachian tube, and an extension to the middle ear. The exanthemata of childhood are often followed by middle-ear disease and most cases of chronic otitis media met with in later life date their inception from such an acute condition.

Twenty-five per cent of adults show some impairment of hearing, of which 75 per cent is preventable.

Treatment: Rest in bed, laxatives, dry heat, and in case the nostrils are closed, the use of 1-8000 adrenalin solution. Then irrigation with hot water, rendered alkaline by sodium bicarbonate. A warm solution of 5 per cent cocain and adrenalin dropped into the ear often gives relief.

With a bulging drum paracentesis is indicated, and as a local anesthetic equal parts of cocain, menthol, and carbolic acid in a little glycerin, applied and allowed to remain in contact with the drum is recommended.—(G. B. T.)

WELLS, W. A. **Vocal strain from a laryngologist's standpoint, its causes and prevention.** South. Med. Jour., vii, No. 12.

Vocal strain may be considered as arising from the following four kinds of causes:

1. Excessive use of the voice.
2. Improper use of the voice.
3. Disease of the vocal organs.
4. Systemic conditions.

The vocal mechanism comprises three parts:

1. The lungs, bronchi, and trachea, which act as bellows to supply the blast of air.

2. The larynx, containing the vocal cords, which regulates the pitch.

3. The resonating chambers above and below the cords which reinforce the vibrations and give to the voice its characteristic quality. The vocal cords regulate pitch by reason of the attachment to them of a number of little muscles, which approximate them as a whole or in segments, to vary their thickness and to produce different degrees of relaxation and tension. This action is supplemented by a number of muscles attached to the outside of the larynx. The injurious effects observed from excessive use of the voice are chiefly due to overaction of the muscles. The general principles of vocal prevention given by the author are:

(1) To avoid excessive use. (2) To avoid wrong methods of using the voice, which can be generally recognized by the fact that they require cramped unnatural positions of the throat and are generally followed by fatigue. (3) To avoid using the voice when the throat is inflamed from a cold. (4) To observe all general hygienic laws. (5) To strive by properly directed exercise to strengthen the neuromuscular mechanism of the voice, and to acquire the art of getting the natural effect with the least expenditure of energy.—(G. B. T.)

REPORTS.

MILITARY MEDICAL WORK IN CONSTANTINOPLE.

By E. P. Huff, Passed Assistant Surgeon, United States Navy.

When, as a cautious local editor recently observed in writing of the first anniversary of the outbreak of war in this country, "the shot was fired in the Black Sea which forced Turkey to enter the war," it found the country well prepared as to military organization. This fact was in no way better demonstrated than by a survey of the preparations made by the Department of Sanitation, which is under the direction of the military organization. Long before the beginning of hostilities the various military hospitals were prepared for work to their full capacity, a complete list was made of all buildings available for hospital purposes, material was collected, and all registered physicians, surgeons, dentists, and nurses were obliged to report and hold themselves in readiness for instant call. Such was the condition of affairs early in the year (before the arrival of any wounded in the city) when, through the kindness of Prof. Dr. Meyer, vice-director of the sanitary department of the district of Constantinople, permission was granted to visit the most important hospitals in the city. Dr. Meyer, whose specialty is bacteriology, had arrived in Constantinople about a year previously, and under his able guidance it is said that some remarkable changes have taken place in the hospitals in his district. But be that as it may, the present condition of all the hospitals visited was a source of constant surprise and is a wonderful improvement over the sad state of affairs which obtained here during and after the Balkan wars which has been the subject of so many disparaging reports, and when some 20,000 sick and wounded had to be hastily provided for in barracks, schools, mosques, and even private houses, with unspeakable sanitary conditions and appalling mortality.

In company with Dr. Josef F. Stutzen, of the German Red Cross commission, recently arrived in Constantinople, and with Dr. Wifik Nahy, Turkish assistant to Dr. Meyer, as guide, the following hospitals were visited:

MALTÉPÉ HOSPITAL.—This is one of the largest and oldest of the military hospitals of the district and is situated about 1 mile beyond the city limits of Stamboul near the Top Khané Kapou (Gun House Gate), the ancient fourth military gate in the great land walls, through which Mohammet II triumphantly entered the city, and just

beyond the great cemetery which marks the site of the main encampment of the Turkish hordes during the final siege of the city in 1453. This building was originally a barracks and was constructed more than a century ago by Sultan Mahmoud, who is famous in history as the destroyer of the janizaries. During the Balkan War and until recently it was employed as a contagious-disease hospital. The building is of stone, of two stories, and is a hollow quadrangle enclosing a large, square central court. Each of the four sides consists of a series of small wards externally, with several long connected corridors facing the court and which serve not only as a passageway but also as additional wards. It has the customary Turkish bath, through which all patients must pass on admission, and a mosque for the faithful. There is an air of order and cleanliness about the place that was entirely unexpected, considering the age of the building and the lack of material which usually accompanies the hasty organization of military forces. The beds are of iron but have no springs, the straw mattresses being placed on boards laid across the frames. This hospital has a capacity of nearly 1,500 patients, about half that number being present at the time of visit. There were at that time no wounded, and the diseases noted were those usually found in the military hospitals here during times of peace. There were no cases of cholera here nor of typhoid fever. Among the medical diseases noted were malaria of the tertian type, with marked splenic enlargement; relapsing fever, for which salvarsan was being given intravenously (the spirillum was demonstrated in a laboratory which was just being fitted up); dysentery of the bacillary (Shiga) type, there being none of the amebic type in the hospital; bilharziosis; numerous cases of Aleppo boil, psoriasis, eczema, symmetrical gangrene, etc., while in the surgical wards there were noted fractures, cataracts (postoperative), amputations, hernias, appendicitis (the McBurney gridiron incision is used whenever possible), empyema, osteomyelitis, fistula in ano and hemorrhoids, bubo, varicose veins, and one case of self-maiming (amputation by a Mauser rifle ball of the first two fingers of the right hand). This hospital is under the command of Col. Dr. Djelal, and he has as his assistants about 15 graduate doctors (all officers in the military service) and a number of students of medicine. The nursing is done entirely by men, who are detailed especially for this work.

GÜMUSH SU (SILVER WATER) HOSPITAL.—This is situated in Pera, overlooking the Bosphorus, near the Germany Embassy. It is one of the most modern of the military hospitals in the city and contains beds for about 300 patients under normal conditions, there being 174 patients under treatment at the time of visit. This hospital consists of a main building containing the offices, laboratories, and principal wards, and a number of detached buildings containing isolation

wards, power house, kitchen, laundry, animal house, etc. It has every modern convenience as regards instruments and materials, and the character of the work done is said to be equal to that of many of the first-class hospitals in America. The pathological laboratory and X-ray room are particularly well equipped, and the work done is excellent, judging from the numerous examples shown. The kitchen has the most modern equipment, including six steam cookers of 300 liters capacity each, steam cookers for soup, tea, and coffee, roasting ovens and ranges, while the laundry is fitted with a complete set of modern machinery including washers, wringers, ironing machines and steam-heated drying racks.

The cases seen here were very much like those seen previously in Maltépé Hospital, with about the usual proportion of medical and surgical cases encountered in a general hospital in peace times. Malaria (tertian) seems to be fairly prevalent as evidenced by the number of cases, and inquiry as to treatment elicited the fact that prophylaxis is used (0.5 gram quinin twice a week), while the method of treating the disease consists in the administration of gram doses of quinin for a week, followed by a week's interval, then a second or third course of quinin. They report good success with this method. We were also shown several cases of bladder bilharziosis, the living ova being demonstrated.

This hospital is presided over by Prof. Dr. Neschat-Osman, who was for some time in the medical service of the German Army, and who has as his assistants eight Turkish medical officers, all but one of whom are in the active military service. An innovation here is the employment of Turkish women nurses, three being three, who for the past year have had charge of the operating room and other departments.

Gul hanéh (House of Roses) Hospital.—This is by far the most interesting of all the hospitals in the city. It was formed about 20 years ago by joining together a number of dilapidated buildings which had been constructed about 30 years previously as barracks, and was remodeled about 5 years ago. It occupies a beautiful site in Stamboul on the Sea of Marmora, on Seraglio Point, just below St. Sofia. In times of peace it is used as a general hospital for men, women, and children, and is the main clinical department of the medical school which is situated in Haidar Pasha, across the Bosphorus. It has numerous lecture and demonstration rooms, and a polyclinic for ambulatory patients. In connection also with this hospital is a postgraduate department for military surgeons and a training school for nurses supervised by a number of German nurses. The hospital ordinarily has 450 beds, but at present there are but 125 patients, the beds having recently been emptied for the reception of wounded. The service is kept active, and as far as possible surgical

cases are selected, although provision is made for all classes of diseases. An interesting feature of this hospital is the method of isolating infectious diseases in small detached buildings of the collapsible-portable type, made of composition board. Each building contains two wards, a bath room, a small kitchen, and a laboratory. Typhoid fever is kept isolated in these buildings, as well as cholera, typhus and smallpox, but none of these diseases were present at the time of visit.

The equipment of the hospital is most up-to-date; the three-table operating room is well fitted with modern sterilizers, etc., the hydrotherapy and thermic-hyperemia rooms are complete, and there is a full set of "Zander" machines for active and passive movements.

Not the least interesting feature of this hospital is the manufacturing department, where 150 men (principally old or disabled soldiers) are employed in the preparation of first-aid packages, dressings, medicines, etc., for the field. Here also are prepared the field medical and surgical outfits and cotton and gauze dressings. Shell-wound dressings are supplied in packages, sealed and sterilized. A feature of the field surgical outfit is a celluloid linen thread supplied on spools in a convenient glass aseptic container. It was stated that this material was cheap, strong, and dependable, and was very satisfactory as a universal suture. As far as possible all medicines are supplied in tablet form, packed in small paper-covered rolls of five tablets each, and suitably labeled as to contents and dosage. The pharmaceutical department contains a fair assortment of tablet-making machines, drying ovens, etc.

The first-aid packages resemble to some extent those used in our service. A rolled bandage 3 meters in length has attached to it near one end, by machine stitching, a small pad of gauze-covered cotton (it was explained that formerly only gauze was used for this pad, but the present scarcity of this article has rendered the substitution of cotton necessary); to the center of the first pad a second and similar pad is attached by means of a short thread, this being intended for the dressing of the secondary wound. This dressing is then rolled, a pencil mark indicating the end to be grasped when unrolling, as only about 15 per cent of the Turkish soldiers are able to read the accompanying directions, which are, of course, printed in the Turkish language. The roll is then wrapped in waxed paper, the sheet of directions applied, then a second wrapping of the waxed paper (this to be used as a waterproof covering after the dressing is applied), and finally a muslin cover, tied by a string and dated. The pads are dyed pink in order to make them more easily recognizable. The complete packages are finally compressed into a small space by means of screw and hydraulic presses (and, in fact, all dressings are so treated before

being sent out), and are sterilized by steam. Eight thousand of these first-aid packages are turned out daily, as well as a proportionate number of other dressings. Starch and plaster bandages are also prepared here, the latter being rolled by hand and then packed into old petroleum tins which are sealed for shipment to the interior.

Another department of this hospital is the vaccine laboratory, where antityphoid and anticholera vaccines are prepared for the army. This building was not yet completed, and but little work was being done at the time. The processes were not demonstrated, but several liters of prepared vaccines were shown, in sealed bottles of from 200 to 500 cubic centimeters capacity each. This is a new industry in Turkey, and the methods are said to be somewhat crude as yet, but excellent results have been obtained with the minimum showing as to accidents.

This hospital is under the direction of Prof. Dr. Wiesing Pasha, who for the past 12 or 13 years has been connected with the teaching staff of the military medical school here. He is a military surgeon of, it is said, unusual experience and ability and has recently completed a book on "War Experiences" (*Kriegserfahrungen*), which deals exhaustively with the effects of rifle fire as observed during the Balkan War. He demonstrated to us a number of cases of osteoplastic surgery (one of his specialties), showing excellent results from the transplantation of bone from the cadaver. He also showed a number of cases of fracture repaired by means of aluminum nails which were giving good results. He has four assistants at present (Turkish medical officers) and is also being assisted to some extent by the German Red Cross commission, which has just arrived in Constantinople. The nursing staff consists of several German women nurses.

A few months later another visit was made to this hospital, this being some weeks after the wounded began to arrive in the city from the Dardanelles. At this time there were about 500 patients under treatment, including 8 English prisoners who had been captured a short time previously from the *E-15* which was destroyed by Turkish gunfire at the Dardanelles. These men were only slightly wounded while escaping and swimming ashore from the damaged submarine, and they seemed to be very comfortable and in cheerful spirits. One of the number was at that time isolated with typhus, of which there were several cases in the hospital, but it is said that he later recovered and that all were sent to the interior of Asia Minor. The patients seen here at this time comprised the more seriously wounded, they having been sent to this hospital on account of its close proximity to the landing (to avoid undue transportation), and also on account of the better equipment at this hospital and the larger and more

experienced staff of surgeons (mostly German). Many severe compound fractures were noted, but the greater proportion of the wounds were of the body cavities.

On January 6 a visit was made to the medical school and hospitals at Haidar Pasha, on the Asiatic side of the Bosphorus, opposite Stamboul. The largest of the permanently equipped hospitals of Turkey is located here and is devoted exclusively to military uses. It has a normal capacity of 1,200 beds, but at the time of my visit had relatively few patients, one of these being a Russian prisoner, a sailor picked up in the Black Sea and one of the few survivors from one of the Russian vessels sunk early in the war.

This hospital, like the one at Maltépé, is a large hollow-square building inclosing a central court. It is two stories in height, with basement, the wards being arranged on the outer sides, with a long corridor facing the court. It has an equipment corresponding to that of the other hospitals visited, and the class of diseases under treatment was about the same. A great many cases of malaria were noted, with a large percentage of marked splenic enlargement. There was, apparently, a large proportion of inguinal hernias, all but one case being right sided; also a large number of cases of hemorrhoids and fecal fistula.

An interesting case shown was one diagnosed as general eczema, said to be the result of contaminated vaccine virus. It was stated that the case resembled smallpox very closely at first and was kept isolated, but at the time of visit it was in a general ward, although the marking of the face was still very distinct. Numerous cases of skin infection involving the scalp were noted, these resulting in more or less complete baldness. The nature of these infections was not ascertained. Pneumonia, bronchitis, pleurisy, pericarditis, emphysema, etc., were apparently prevalent, which confirms the generally accepted opinion as to the effect on the health of the climate of this country; but no cases of rheumatism were noted nor any of tuberculosis, although the latter disease is widespread in Turkey. It is not known that there are any special hospitals for tuberculosis, but it is known that patients are frequently returned to their families when ill with this disease. Numerous cases of syphilis were seen, this disease being very prevalent here, especially so among the soldiers, in spite of the rather severe law forbidding public women to entertain the Turkish enlisted men. In the interior of the country, however, whole families are infected innocently with syphilis as a result of ignorance and poor hygienic surroundings, and this fact, combined with lack of treatment, may account for the signs of tertiary lesions so prevalent on the streets in otherwise respectable-looking peasant people of both sexes.

This hospital has a detached modern surgical pavilion with operating room, two small wards, etc., but this is in no way connected with the main building. It has two operating tables and is apparently well equipped. It is presided over by a German nurse with American training (Beth Israel Hospital, New York), and she is the only woman nurse in the hospital.

The hospital is commanded by Col. Dr. Hilmi Bey, who explained that he had at one time been a student of the great Charcot. His specialty of course is neurology. His staff consists of about 15 Turkish medical officers.

Near the Haidar Pasha Hospital and in a very prominent position overlooking the Bosphorus is the imposing landmark, the Government Medical School and attached clinical departments. This is a modern stone and concrete building of three stories completed some eight years ago, and comprises both the civilian and military schools of Turkey, with a capacity of 800 students—300 military (army and navy) and 500 civil. The building is of the usual quadrilateral type inclosing a large court. The basement is devoted to the kitchens, mess halls, furnace rooms, etc., while the second floor is occupied largely by the dormitories. The usual Turkish bath is in a semi-detached building. The third floor is given over entirely to the laboratories, class and lecture rooms, and is the most interesting part of the institution. The fittings, instruments, and models so far as could be observed are entirely of German manufacture, and the system of instruction is patterned after the German. The list of scientific instruments, etc., is apparently complete in every detail, and if one could judge from the excellent character of the large number of pathological and anatomical specimens displayed in the museum, the character of at least the laboratory work done is of the very first class. The dissecting room is the largest I have ever seen; it is light and well ventilated, contains about 25 marble-top tables, and is as neat and well fitted up as any operating room. The ceilings of all the rooms are immensely high, and the rooms so enormous that the steam heaters scattered through the building seem entirely inadequate for heating purposes, although the military authorities plan to put in 500 beds in case of necessity.

The course in medicine comprises five years' studies (including clinical work), is open to both Mohammedans and Christians, and seems very popular. As in all the other higher schools in Turkey, there is no charge for tuition, and in the medical school, as well as in the other professional schools of the city, students who are intended for Government service, with a certain number of other students, receive not only tuition, but board, lodging, and clothing from the school. Unfortunately, the classes have been discontinued on account

of the war, the students having been distributed to the various hospitals and army corps.

The medical school is under the command of Prof. Dr. Zia Nouri Bey, who was very kind in showing every detail of the institution.

The clinical department occupies a building of modern type across the street from the medical school. This is devoted to the treatment of all classes of patients and diseases, but at present it is being reserved for military purposes. It has a capacity of about 100 beds and is well equipped for the practice and teaching of the various specialties. The operating amphitheater is modern and spacious, and is well equipped with all the latest instruments and appliances. A hand-worked elevator communicates with the floor above, where the surgical patients are cared for. There are two trained nurses in the operating room, one Danish and the other German. About a dozen German nurses are attached to this hospital. There is also a training school for women, three months of theoretical and two years of practical work. Thirty or more pupils completed their course of instruction last year.

Naval hospital.—On March 28 a visit was made to the Hospital of the Marine which is situated near the Admiralty in Kassim Pasha, a suburb of Galata, on the Golden Horn. Kassim Pasha is the principal naval base in Constantinople and surrounds a small bay in the Golden Horn near where, during the siege of 1453, the Turkish ships were again floated after having been brought overland across the Galata Peninsula from a point on the Bosphorus near where the imperial palace of Dolmabaghcheh now stands.

The hospital buildings occupy a site on a promontory overlooking the water, and it is an ideal location for a hospital. The main building is quite old (probably a hundred years) and was formerly used as a prison and later as a military school. To the main, two-storied building have been added several modern pavilions, the one to the east being unusually well equipped as a surgical pavilion. The upper and lower floors of this latter building are occupied, respectively, by clean and septic surgical cases, and each floor, while complete in itself, has a large, well-lighted operating room with two tables and a most complete modern equipment.

This hospital has 250 available beds, with 235 patients at the present date. The capacity of the hospital is 400 beds.

Connected with the hospital is a scientific laboratory where the analytical work for the entire fleet is carried on. It is a well-planned building of one story, well lighted, one-half being devoted to chemistry and the other half to bacteriology. Here are prepared all sera and vaccines used by the navy, including typhoid, cholera, gonococcus, and dysentery vaccines. The animal houses are connected with this

building, there being on hand an abundant supply of guinea-pigs, rabbits, etc. This department is under the direction of Dr. Omer Fuad Bey, inspector general of the Imperial Ottoman Marine Health Service, who very kindly gave a complete demonstration of the equipment.

At the time of the visit there was nothing of especial note among the patients, the diseases, both medical and surgical, being those ordinarily met with in a naval service in peace times, as up to this date no naval encounters had occurred to increase the percentage of wounded.

OTHER HOSPITALS.—In addition to the already described regularly equipped military hospitals there may be added to the list provided for sick and wounded soldiers the various national hospitals, the German, Austrian, Italian, Russian, Greek, Armenian, Jewish, French, and English. The last two have come under the management of the American Red Cross Society, and while offering only 150 beds together, are finely equipped and thoroughly up-to-date and were already made use of early in the war by sick soldiers sent in from the various garrisons in and about the capital.

EMERGENCY MILITARY HOSPITALS IN CONSTANTINOPLE.—At the commencement of the present war it was stated by the Turkish authorities that there were in Constantinople 12,000 beds immediately available for military uses. This would seem a just estimate, judging from the number of regularly equipped hospitals and the average capacity of those visited, there being a total of about 15 hospitals under the management of the military and Red Crescent organizations. However, this by no means exhausted the resources of the city, as the numerous enormous barracks required but little transformation to convert them into fair emergency hospitals, while the various Government schools added another large quota of beds with surroundings even more favorable than those of the barracks. In addition to the above, numerous schools and other buildings belonging to the belligerent nations have been occupied by the Red Crescent organization, with the result that there were early made available a very large number of beds, amounting to some 50,000 as a conservative estimate.

The capacity of the hospitals in the interior of the country is unknown, but it must be considerable if one may judge from the large number of patients, largely convalescents, who have been shipped out of the city to the interior in order to better permit them to recuperate, either in other hospitals or at their own homes, before returning to the front. The result of this policy has been that the service in the hospitals of Constantinople has been kept very active, the greatest possible number of beds always being kept available

for emergencies; and this constant changing has resulted in vastly increasing the capacity of each hospital for the entire period since the wounded began to arrive in the city. Fortunately the sick rate from disease has been practically *nil*, so that the number of patients treated represents the wounded only. At this stage it is impossible to get even an official hint as to the total number of wounded that have been treated in Constantinople, but a conservative estimate would put it at well over 100,000. It is not known just how many hospitals there are at the Dardanelles and at other points on the Sea of Marmora, but it is probable that the vast majority of patients sooner or later reach the capital, either for treatment or for further transportation into the interior, and this is evidenced somewhat by the promptness with which the wounded begin to arrive in the city after any reported engagement.

Following the first important engagement at the Dardanelles, on April 25 to 27, active preparations were made in the city for the reception of the wounded. The first transport bearing wounded arrived on Friday morning, April 30, and they have continued to arrive at varying intervals ever since. Some six or eight large and small transports disembarked at Constantinople and Haidar Pasha, across the Bosphorus, during the first four days in May, and up to May 4 it was estimated that about 10,000 wounded had been landed. The more serious of the wounded were removed to Gul Haneh and other near-by, well-established military hospitals, while the less severely wounded were sent to the various foreign hospitals and the newly established hospitals of Galata Sarai School (where some 500 beds were then filled) and the Harbié Military School, in Nichantache, where about 900 beds were filled. Then rapidly followed the opening of Matchka Barracks, Tash-Kishla Barracks, the numerous smaller schools, etc.

The fortunate absence of any extensive epidemics among the army and civil population of the city has rendered the task of caring for the wounded a comparatively easy one, but one is immediately struck by the marked improvement over the condition of things which existed in Constantinople during the Balkan wars, when many private houses and nearly all the mosques were used as camps for refugees and as hospitals for the cholera patients, who died by the thousands, in many cases wholly unattended. Even the much-scarred and historic old pile of Santa Sofia had another chapter added to its tragic history in having its floors and corridors covered with cholera patients who were practically uncared for and many of whom died lying in their own filth. The Balkan wars proved an education which the participants all profited by, and one must give the Turks full credit for the remarkable progress they have since made and for their

present excellent organization and successful military operations, and especially for their present care of the wounded and humane treatment of belligerents which makes even their Christian opponents wonder.

The list of emergency hospitals is a long one, but most of them are unimportant in so far as numbers of patients are concerned. Data are not at hand for a complete list, nor for a description of any but the two following, which are the largest and best known of them all.

HARBIÉ HOSPITAL.—This is situated in Nichantache, beyond Pera, and is the military (cavalry) school and barracks of the same name. It is a huge two-story building, some 300 feet deep by 900 feet in length, and was hastily converted into a hospital on May 1, after about three hours' notice, by the reception of 600 wounded. It has a capacity of about 3,000 beds. It has the customary central court, partially paved, containing a central fountain and numerous trees. The corridors face the court, with the large and numerous wards upon the outside. As a barracks the building is unusually well fitted and sanitary, and contains a pharmacy and a small one-table operating room with adjoining dressing room which is made to serve the needs of the entire hospital.

At the beginning of the work here the medical staff consisted of about a dozen Turkish, Greek, and Armenian civilian practitioners who were hurriedly called into service and later commissioned and uniformed as officers in the army. The surgical staff consisted of three members (including the writer), who devoted their time exclusively to operative procedures. The nursing staff consisted of three trained and about two dozen volunteer nurses (American, German, Turkish, Greek, and Armenian) who did faithful and excellent work.

With the increase in number of patients many German medical officers from the ships in the harbor joined the staff; the nursing force was put under the superintendence of the two daughters of Leman von Sanders Pasha; a number of German Red Cross doctors and nurses arrived, and at present the hospital is practically managed by the Germans in so far as the medical and surgical work is concerned. Dr. Chakir Bey is in command of the hospital and he deserves much credit for his able management.

The number of patients treated here has been enormous. For some time the entire 3,000 beds were occupied by wounded. About 100 British and French prisoners were for a time under treatment in this hospital, but they have now been removed to Tash-Kishla. On May 3, two days after the hospital opened, the writer and his wife proffered their services to the management and were gladly welcomed

as members of the staff. While our work here proved of brief duration it was intensely interesting and valuable from many standpoints.

TASH-KISHLA (STONE BARRACKS) HOSPITAL.—This is a large quadrangular stone building, with the usual central court and fountain, etc., near Taxim Garden, in Pera, and across the street from the model little Austrian hospital. It was built many years ago as a barracks and is rather poorly constructed for hospital purposes, being originally planned with numerous gun racks and with no provision for beds, having instead platforms on all sides of the room raised about 8 inches from the floor, upon which the beds now stand. This building was occupied as a hospital during the Balkan war when some excellent work was done among both wounded and cholera patients, as reported by Maj. Ford, United States Army, who was a worker here at that time.

This hospital was also opened hurriedly the latter part of May, but unlike Harbié, was and still is under military control and hence lacked the advantages of the better organization and abundant supplies which characterize the hospitals under Red Crescent management. It has a capacity of about 2,000 patients and is under the command of Col. Dr. Zudti Bey, of the Turkish Army.

During the Balkan War a small detached laundry was built in connection with the hospital, but this has always proved inadequate for the needs of the place and the result has often been a pitiable lack of linen for both beds and patients. The commissary department is primitive but adequate, the kitchen containing several built-in brick ranges with huge iron caldrons. The usual Turkish bath is sufficiently large for its kind, but is situated at such a great distance, in a detached building reached through the basement, that it is useless except for patients who are well enough to leave the hospital.

Recognizing here a greater than usual need of services and materials, and at the request of the hospital management and the earnest solicitation of many members of the American colony who were desirous of contributing their services and material donations under the direct guidance of an American doctor, the writer and his wife began work in Tash-Kishla on May 24. Two wards on the ground floor, with a total of about 125 beds, were placed under our exclusive care by the director. The prospect was indeed disheartening, and but for the help of the enthusiastic and generous Americans who came to our assistance in considerable numbers, the task would have been impossible. The wards were dark and gloomy and from long disuse were covered with an accumulation of dust and cobwebs that only whitewash and paint eventually succeeded in obliterating; many windows were broken, the water-closet (open, Turkish style) was filthy, and, owing to lack of doors, filled the place with odors; the

corridors were constantly wet with water tracked from the toilets; and, to crown all, there was no place except a small filthy room, then being used as a barber shop, which could be used as an operating room or dressing station.

However, the work of renovating went ahead with a rush. The small room was cleaned out and whitewashed, and later a muslin lining was tacked over the rotten and dusty ceiling; tables, chairs, basins, instruments, and dressings were collected, an oil stove and supply of kerosene were donated by the Standard Oil Co., the wards and toilets were cleaned out and dried, and a much-needed change of linen secured. Within a short time many minor operations had been done, all wounds examined and dressed, and the patients made so comfortable that long lines waited outside the dressing room that they might the sooner again go through the operation of having their wounds redressed and rebandaged. The Turk patient is peculiar in that he wants constantly to be examining his wound to note its progress and will often surreptitiously loosen or remove the dressing in order to have a better view of it; but when it is remembered that many of these poor fellows had had but one dressing and no baths or change of linen during the entire 17 days since the battle in which they had been wounded, their apparent lack of patience is not to be wondered at.

Two similar wards on the upper floor had been placed under the charge of Madam Ponfili, an American lady, now the wife of one of the Austrian embassy staff, and these were undergoing a like transformation as a result of the generosity of the Austrian ambassador and various members of the colony. Still other wards were being conducted by the Germans and Dutch, while Turkish and Greek doctors were looking after the greater number of patients on the ground floor, being assisted by two Turkish young ladies and some Austrian sisters.

Our work apparently gave such satisfaction that the director soon requested that we take over one-half of the entire lower floor, with a total of about 500 beds. This, however, appeared impractical until early in June, when the American ambassador, accompanied by a contingent of Red Cross from Beirut, who were in the city waiting for an opportunity to assist the Turks, called to inspect our work. The writer suggested to the ambassador the desirability of taking over the larger work and again requested that the Red Cross furnish some assistance, which had hitherto been denied us. The ambassador considered the plan favorably and proposed communicating with the chief of the sanitary department, Suleiman Neuman Pasha, and offering the services of the Red Cross at Tash-Kishla. This offer was accepted, and our forces were augmented by the addition of two doc-

tors and four trained nurses from the American missionary college at Beirut. It was then decided to expend a considerable amount of Red Cross money in cleaning and fitting up the place, and, with the assistance of a squad of men from the U. S. S. *Scorpion*, the beds, wards, and corridors were soon renovated with soap and water, paint, and whitewash. The hospital authorities agreed to supply the food, ordinary bedding, and unskilled service, while the rest of the equipment and the surgical treatment were supplied by the Red Cross. A separate bathing establishment and a separate laundry were later inaugurated to insure cleanliness and an adequate supply of linen, clean bandages, etc.

Unfortunately, increased restrictions on board the ship soon terminated the writer's hospital service, but reports indicate that the work in the American section at Tash-Kishla has gone steadily on, and that a great amount of good has been accomplished. A number of missionary doctors have from time to time assisted in the work, and, while the staff has been constantly changing, the work has apparently been highly satisfactory to both the patients and the Turkish authorities.

At present there are nearly a hundred English and French prisoners under treatment in this hospital, but they are very closely guarded, and foreigners are not permitted to come in contact with them.

VOL. 10 NO. 3

UNITED STATES NAVAL
MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL
DEPARTMENT OF THE SERVICE

ISSUED BY
THE BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT
DIVISION OF PUBLICATIONS
PASSED ASSISTANT SURGEON ROBERT C. RANSDELL, U. S. NAVY
IN CHARGE

JULY, 1916
(QUARTERLY)

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

NAVY DEPARTMENT,
Washington, March 20, 1907.

This United States Naval Medical Bulletin is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

NOTE.

Owing to the exhaustion of certain numbers of the Bulletin and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume I, No. 1, April, 1907.
Volume I, No. 2, July, 1907.
Volume II, No. 1, January, 1908.
Volume II, No. 2, April, 1908.
Volume VII, No. 3, July, 1913.

SUBSCRIPTION PRICE OF THE BULLETIN.

Subscriptions should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C.

Yearly subscription, beginning January 1, $1; for foreign subscription add 25 cents for postage.

Single numbers, domestic, 25 cents; foreign, 31 cents, which includes foreign postage.

Exchange of publications will be extended to medical and scientific organizations, societies, laboratories, and journals. Communications on this subject should be addressed to the Surgeon General, United States Navy, Washington, D. C.

TABLE OF CONTENTS.

PROGRESS IN MEDICAL SCIENCES: Page

REPORTS:

PREFACE.

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part as extracts) throughout the service, not only will they be employed to some purpose as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Reviews of advances in medical sciences of special professional interest to the service, as published in foreign and home journals, will be given particular attention. While certain medical officers will regularly contribute to this work, it is urged that all others cooperate by submitting such abstracts from the literature as they may at any time deem appropriate.

Information received from all sources will be used, and the bureau extends an invitation to medical officers to prepare and forward, with a view to publication, contributions on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

W. C. Braisted,
Surgeon General, United States Navy.

U. S. NAVAL MEDICAL BULLETIN.

VOL. 10. JULY, 1916. No. 3

SPECIAL ARTICLES.

A CONTRIBUTION TO THE STUDY OF ARTIFICIAL ILLUMINATION.[1]

By J. D. GATEWOOD, Medical Director, United States Navy.

There is no more sublime passage in literature than that found in the Biblical account of creation: "And God said, Let there be light; and there was light."

In that statement of the birth of light one finds material for the construction of a picture of wonder as a radiant flood of energy sweeps away the barriers of absolute darkness—of continuous night—and brings into existence the very first day of a world in chaos.

And in that record of the birth of light as on the very first day, man finds something closely in accord with such dim appreciation as he may have of the eternal fitness of things. To him who is so helpless, whether in the darkness of ignorance or in that darkness which is the absence of light as a physical agent, there is appeal in the thought that even in the work of creating a world the first requirement was light. He knows the primary requirement in all of his own work to be that same essential. From his own beginning he has been stumbling in the darkness of ignorance, struggling to make some agreement between ideals and realities, and in that struggle he has gathered, often in a haphazard way, a little luminous material with which he has now begun to build a shining temple of science; and in his daily mechanical work he has awaited the dawn—the coming of the light—for permission to till the soil and to gather the fruits of his labor. Through the time of his existence he has been in darkness as a child afraid to take a step, and night, without his own contrivances, would necessarily be a period of resting helplessness. It would seem as though nature had imposed upon man the obligation of general inactivity during half the hours of his life—the primitive obligation to lay himself down as the curtain

[1] Read in Sec. VIII of The Second Pan American Scientific Congress, Dec. 27, 1915–Jan. 8, 1916, Washington, D. C.

of night descended and to await the dawn—the coming of that light which in the beginning was divided from the darkness and called day.

But man, in his restless ability to alter his surroundings, has never been satisfied with the restrictions imposed by such a division. Light gives liberty of action, precision of movement, and increased social opportunity: and the ability to provide light leads to a greater sense of security and a higher appreciation by man of his own intelligence and his own power to contend against natural limitations. He is the reasoning animal, and much of his reasoning is devoted to the furtherance of his own inclinations. He struggles for freedom, but always finds he has to live under natural laws. He fights for liberty and he pays for everything he gains. Yet, in it all he lives by his visions—by the things that he sees.

In his struggle his career has been marked by the burning candle, burning at one or at both ends, and by the burning midnight oil. While to-day, having observed the shattering of darkness by the lightning's stroke, he has harnessed the lightning itself, and has driven it with all its splendor into his home, his school, his counting house, and his laboratory.

Man reaches into the darkness with shining fingers constructed by himself and finds the distant ship making its way over the dark waters, or with shortened and slender figures of light he touches the printed page and reflects into the mind of the scholar the thoughts of the world.

Yes, man has become the intellectual animal and has even learned to love mental activity for its own sake. He makes theories to account for the phenomena around him and becomes so intense in his affection for those same theories, or beliefs, that they are his intellectual children, for whose welfare he would suffer martyrdom itself.

And man has so learned to admire what he calls knowledge that he insists upon its general diffusion. He invented written language and he invented the art of printing, and has so improved its methods that the leaves of books threaten to become as common as the leaves of the trees of which so many are sacrificed each year to make those very pages that, under a compulsory system of education, the young are required in day and night schools to scan laboriously for hours at a time, pages often printed in small type and viewed with straining eyes under poor illumination and through concave or compound glasses. Newspapers and books have caused an enormous increase in the number of oculists and have caused the saddle to be placed upon many a nose. While man seeks freedom he places his own eyes in harness and at the same time often gives rein to minds made wild by the whip of that little knowledge which is a dangerous thing. Indeed, it sometimes seems that whenever masses of mankind are lifted

or lift themselves above the primitive plane there is damage, which is generally excessive along some line.

Certainly the very intense and general effort of mankind to live in the light of such knowledge as comes from the prolonged drilling of each generation in the near work required for the study of many thousands of printed pages has involved a damage to eyes that is very much in evidence. Some of this damage is undoubtedly inseparable from the near work itself, especially when it is forced on children under 7 years of age. But, on the other hand, not a little of it accrues from the use of small type and from faulty methods of study, including improper illumination of schools and homes, both natural illumination and artificial illumination. Certainly there is a lamentable lack of legislation on the part of the State in regard to proper paper and type in the making and printing of the books its citizens are required to read. Then, too, many a youth spends delightful hours trying his eyes with the very small type generally found associated with the cheap paper of the dime novel or even of many low-priced editions of standard or classic works. And this reading is often done in the home at night with the aid of a flickering or an improperly placed light that may even be of such little power that the small type has to be brought closer than should be necessary for recognition, an approximation that facilitates in increased degree that deformation of the eyes which is the condition of myopia.

The most interesting part of this entire situation is the fact that few seem to give attention to the abuse of the most valuable special sense man possesses. Fathers and mothers, who are the guardians of the home, and even the administrators of a number of places of learning, often, or generally, seem quite unaware of their responsibilities in this connection. They seem to be unaware of the tremendous strain to which eyes are subjected by the requirements of our boasted civilization. They do know the humiliation illiteracy entails, and, therefore, the more studious their children are under any condition, the greater is the parental pride.

Is it not strange that, while one hears of numerous societies and associations formed for the purpose of disseminating information on such subjects as fresh air, exercise, diet, pure food, pure water, the white plague, the red plague, and a host of others, one fails to find public interest so expressed in illumination, in those measures so clearly necessary in the homes and schoolrooms of the people for the preservation of the sight of a nation? There is a degree of examination and consideration in some public schools, and of course there is the important medical effort in prophylaxis in relation to that blinding ophthalmia of the new-born, but those minds that are working in the direction of meeting the physiological requirements of the eyes

of the people in relation to near work find a lack of interest on the part of the people themselves—the need of a certain degree of education it has been difficult to secure. However, there are signs of an awakening, and one might now predict that the time is coming when at least the sleeping porch will not be more common than properly lighted rooms devoted to near work. One might even predict that the time will come when the illuminating engineer with the illumination photometer will be as freely available for the homes of the people, and will be regarded as quite as necessary for the prevention of damage, as the health officer is to-day.

The idea the average individual has of the eye is quite interesting. At various times he has had some foreign body in the eye, or under the lid, and the result has led him to the conclusion that the eye is a very delicate organ. The thought generally stops there, confined in its relation to foreign bodies or injuries. If he thinks of the eye in any other way it is usually as some kind of a wonderful optical instrument, that in his own case is constructed to meet all possible requirements except looking at the sun or seeing in the dark. It is, he thinks, such an obedient, willing, and capable servant that "seeing is believing," and yet, at the same time, it is such a delicate organ that it gives immediate warning of any injury it sustains or is sustaining. And ordinarily such ideas seem to control the individual until some deterioration in function is observed by himself or his guardian. It seems that the millions of glasses straddling the millions of young noses are regarded as an expression of either so much unavoidable misfortune or as merely an indication of price paid for knowledge acquired. And unfortunately to a certain extent that is true, but only to a certain extent.

It is not necessary, or even advisable, so far as the purposes of this article are concerned to indulge in any attempt to describe the eye and its connections. It does seem proper to recall certain things in relation to the eye that have important relation to artificial illumination and near work. In such connection is the fact that the human being is born hypermetropic, or with the eyeball so short that parallel rays come to a focus not on but behind the retina. It is only as the eyes develop and as they are used that they generally come to their own, and perhaps the majority do not acquire full elongation until 14 or 15 years of age. But some eyes eventually go beyond, or develop myopia, the antero-posterior diameter becoming too great, as they are converged on too much near work and pressed by the very muscles that give them movement. It is noticeable, however, that the effects of such pressure are only apparent on some eyes, that they appear in youth, or at a time when considerable demands are made upon the eye in the way of near work, and that in such acquired

myopia there is often a degree of predisposition depending upon anatomical peculiarities apt to be inherited, as the children of near-sighted parents show a greater tendency to become myopic.

Thus, at the United States Naval Academy it appears that the eye troubles associated with eye strain are in general the cases of hypermetropia, which are in those eyes that have never developed, and which, requiring muscular effort of accommodation even for distant objects, appear most frequently at sick calls complaining of the pain incident to the additional accommodation required for near work; and the cases of myopia which get along often without coming to sick calls, but which are disclosed at the examinations to which the personnel is regularly subjected.

In considering these cases in relation to illumination it is quite evident that hyperopia, such as is found at the Naval Academy, is not produced by near work but is traceable to arrested development of the eye. However, good illumination is required by such cases, because, for instance, if the illumination is insufficient the work has to be brought nearer to the eye, and the accommodative strain, already greatly taxed, becomes to that extent so much the greater. But in myopia there is a direct causative relation between the condition and the near work itself. Cases of myopia would appear in number even if the student's life were passed under no other light than that of day. Yet, it is certain that nearer work, such as is required by insufficient illumination, accentuates results in those predisposed to myopia and in a certain number of cases produces it in those who would otherwise have remained free. Nevertheless, the myope finds in the near work itself the chief exciting cause which is operating in cases of progressive myopia upon eyeballs predisposed to elongation. Therefore, it seems quite clear that, so long as hypermetropia is congenital and the myopic eyeball is very generally produced by the intense near work itself, no system of artificial illumination can keep a school free from such defects. If the hyperope is not to be found at a naval school he will have to be excluded at the physical examination for admission; and for the myope to be much more rarely found there not only is proper illumination required, but also a very careful exclusion by examination for admission of all eyes that do not very readily see true Snellen type at the prescribed distance of 20 feet. Certainly a school for naval work is entitled to start its students free from any discoverable defects in either eyes or ears.

Yet, in any school, or anywhere, proper illumination decreases the strain of the hyperope, diminishes the progression of myopia, lessens ciliary spasms, and makes near work easier for all eyes by limiting or abolishing iris and retinal shocks and, when a reasonable amount of area is illuminated, by permitting changes of position while study-

ing, thus relieving the body as well as the eyes from fatigue. In general, it is essential for school efficiency.

It is very important to recognize that there is a fixed relation in normal eyes between degree of convergence and degree of accommodation, and that relation is disturbed both in hyperopia and myopia. In both there are tendencies to unbalanced action between the ocular muscles and the muscle of accommodation. Thus, spasms of the ciliary muscle develop as a consequence of continuous near work. However, though much more common in the hyperope and myope, they may even appear in eyes having no refractive error. All these cases are in the class that is so often greatly improved by atropin and rest, and in relation to the exciting cause of such spasms the increased strain incident to insufficient illumination is apparent, inasmuch as it necessitates closer approximation of work to eyes and consequently greater convergence and more accommodation.

In artificial illumination there are also important considerations that depend upon the behavior of the pupil under different degrees and varieties of illumination. In this connection it is not sufficient to realize that the pupil contracts in the light and dilates in the dark. For instance, it is stated that if, beginning in a dark room, a light is placed to one side of the eyes and the person looks straight ahead into darkness the pupil remains dilated, or even dilates, but if the person, while appreciating the light, looks in its direction but maintains the focus for distant vision, the pupil contracts. The conclusion is that light stimulating the peripheral parts of the retina does not cause contraction of the pupil. It is when the light falls on the central region of the retina that contraction occurs. Yet, it is away from the fovea that the retina has the greatest light sense, or power of distinguishing different degrees of brightness. It is also there that perception of movement is greatest, in spite of the fact that the fovea is the location of greatest visual acuity.

It is quite evident from these facts that it is from the peripheral parts of the retina the individual must receive many very necessary warnings. And perhaps not the least of these warnings is found in the sensation of glare. In a room vision is bounded by walls in the direction of which one often looks, frequently with eyes as for distant vision. But under any circumstances of vision, white walls highly illuminated, or any walls that seem brilliant in comparison with one's desk or work, are reflecting too much light that reaches the peripheral parts of the retina. This occurs the more readily because, as has been shown, such brightness is not associated with corresponding degree of contraction of the pupil, and also because in whatever direction one may look some one wall is acting as a side light. This is true even when one is engaged in near work.

It is along such lines that a part of the indictment is found against the use of side lights in the artificial illumination of any study room and also against the utilization of walls, but not ceilings, as reflecting surfaces for even the larger proportion of light required in near work. Yet there is recognition that good general illumination is an essential in all good lighting schemes.

Even daylight itself can not be allowed to illuminate without restricting the white walls of a room. When reading, one tends to get somewhere near a window in order that the best daylight may be on the page rather than on the walls, and the reader does not face the window which is acting as the source of the diffused light. And for even a better reason he is unwilling to be under the influence of the glare derived from white walls. In no schoolroom, study room, or office building should white walls be permitted. Then why under artificial illumination should one obtain eye comfort when the walls themselves are acting as though they were the very source of light?

On the other hand it is just as important to observe that dark surroundings cause quite as much discomfort as excessively brilliant ones. The contrast in looking up from well-illuminated work into comparative darkness causes the same variety of shock the eye receives in going from a light into a dark room, and, having looked into the dark, the return to the illuminated work is made with dilated pupils, which for a period permits the retina to be dazzled by light. It is in this direction of iris shocks that indictment is found against a complete direct system of lighting—the system which with opaque shades floods the work with light while leaving the surroundings in comparative darkness. A good lighting system must provide well-illuminated surroundings—sufficient to prevent marked contrasts either in the form of darkness or brilliancy when comparison is made with the degree of illumination required on the work itself.

It is interesting to note that the whole question of glare is intimately associated with the peripheral parts of the retina because there is found in greatest degree the visual purple or visual rose. Under the action of light this pigmentary albuminoid photochemical substance is bleached and in corresponding degree the light sense is diminished. In the dark this substance accumulates, and it is then that the eye is in condition to be painfully dazzled when exposed to relatively bright light. On the other hand, it is in light that this substance changes until there is adjustment, the eye becoming accustomed because it has lost some of its appreciation of light.

Recent observations seem to show that, while the visual purple appears to be almost entirely among the rods, its particles are in reality not fixed, there being movement or flow toward, between, and then away from the cones of the macula, where it must rapidly

undergo modification or bleaching. Nevertheless, it appears almost entirely as visual purple in the peripheral parts of the retina, where its presence accounts for the greater light-sense of that area and consequently for the greater sensation of glare when the eyes are under the influence of brilliant side walls or direct sources of light on such walls.

The primary functions of the visual purple declare the meaning of such terms as "light adapted" and "dark adapted" when applied to the eye. When a person remains for a time in a dimly lighted room or a comparatively dark room an increased sensitiveness to light results, due to increase in the visual purple. Such an eye is "dark adapted." When, under such circumstances, one comes again into the light, the eye is very sensitive, and there is sensation of glare which decreases as the visual purple decreases under the bleaching action of the light. Ultimately under light of reasonable brilliancy tolerance is established, and then the eye is said to be "light adapted" so far as the particular brilliancy to which it is then subjected is concerned. But if the brilliancy exceeds the power of adaptation, the visual purple is bleached more rapidly than it can be formed and a certain insensitiveness to light results which causes a variety of dimness of vision, as the surroundings, though brilliantly lighted, seem indistinct. Too often this situation has been in evidence when uncovered electric filaments have been used as side lights. It constitutes not only a very uneconomical use of light, but also a direct attack upon the integrity of the eyes. But even within limits of ultimate adaptation it is quite evident that glare will result whenever a lighting installation requires rapid eye adjustments such as are demanded in any complete direct system of lighting or in any indirect system that causes side walls to seem brilliant in comparison with the apparent luminosity of the work. Near work itself causes a degree of contraction of pupil which is lost on looking up from the work. Therefore, if side walls are even as brilliant as the work itself a greater volume of light is admitted than when the eyes are on the work. Students find more comfort when the work is rather better illuminated than the surroundings. Such a situation tends to avoid objectionable contrasts.

In seeking standards of illumination for near work such as is found in schools and homes, it is quite evident from the above that a fairly well "light adapted" eye is desirable. There must be good illumination from that point of view, but well within the limit of possible discomfort even under prolonged use. The object is a fairly stable state of eyes, and that object would be defeated by excessive brightness of objects liable to come within the field of vision, such, for instance, as the light source itself.

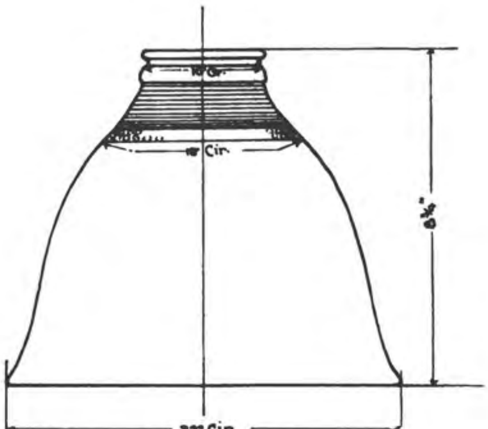
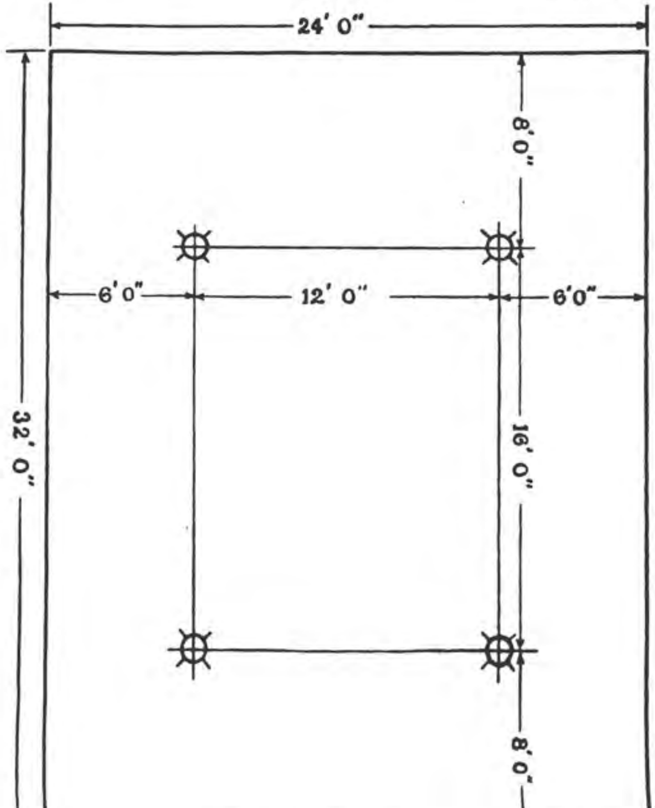


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1.—Plan of reflector for tungsten lamp. (Boston Public Schools.)
Fig. 2.—Tungsten lamp, shade, and supporting fixture (Boston Public Schools.)
Fig. 3.—Holophane stalactite globe. (U. S. Naval Academy.)


24' 0"
32' 0"
8' 0"
16' 0"
8' 0"
6' 0"
12' 0"
6' 0"

Concentration of light shown by the light source is generally spoken of as "intrinsic brilliancy," and expressed as candlepower per square inch of surface. The intrinsic brilliancy of an ordinary candle is only 2.5, which is the same as the average brightness of the sky, to which the eye may be considered to be more or less adapted. But the carbon filament has an intrinsic brilliancy of 400 and the tungsten filament of 1,000. Such high intrinsic brilliancies constitute a veritable danger to eyes unless the light source is screened, which is also economical, because it is not light on the eyes that is desirable but light on the surroundings, on all the things that are to be seen. Thus, suitable screens or reflectors are a means of managing the light supply, giving it the desired direction and at the same time protecting the eyes from the light source itself. A Holophane globe, although completely surrounding an electric bulb, directs more of the light downward, and at the same time, by substituting a large area for the small area of the filament, lowers the intrinsic brilliancy even of a tungsten lamp to about that of the candle or of daylight sky, which many regard as the maximum that should be allowed in any study room.

However, as the absence of side lights is a prerequisite for proper artificial illumination of a study room, it is evident that fixtures must be on or suspended from the ceiling. Among the objects in so locating sources of light is their removal not only from the line of vision, but also from the ordinary field of vision, and, of course, if that is accomplished the requirement for very low intrinsic brilliancy becomes less important.

In placing lamps overhead in any ordinary study room at home, it is believed that the minimum and ordinary distance from the floor should be 8 feet 6 inches in what might be called the semidirect system. That is the system in which diffusive shades are used but a larger proportion of direct light furnished than in the semi-indirect system which utilizes a dense, opal glass bowl hung about 3 feet below a white ceiling upon which much the larger proportion of light is thrown for reflection.

In a large room, such as in a public school, there would be more light units, and, in the semidirect system, necessity for greater elevation of fixtures in order to secure a fair degree of removal from the many lines of vision at varying angles. In that relation it has been stated that the angle made by the line from lamp to eye with the line from eye to work on a desk should not be less than 30°.

In a Boston public-school room (28 by 28 by 14 feet) there are nine light units, each consisting of a tip-frosted, 60-watt tungsten lamp placed in a diffusing prismatic reflector coated on the outer or inner surface with white enamel to the degree of appearing frosted. This

is evidently for the purpose of increasing the proportion of direct light. Yet, it is stated that "the diffusing quality of these shades is so great that the foot-candle illumination on the desk directly below one of the lamps was appreciably no greater than the illumination on the desk in any one corner." These lamps are placed 10 feet 6 inches above the floor, each swung from the ceiling by a chain which suspends the shade holder, shade, and socket.

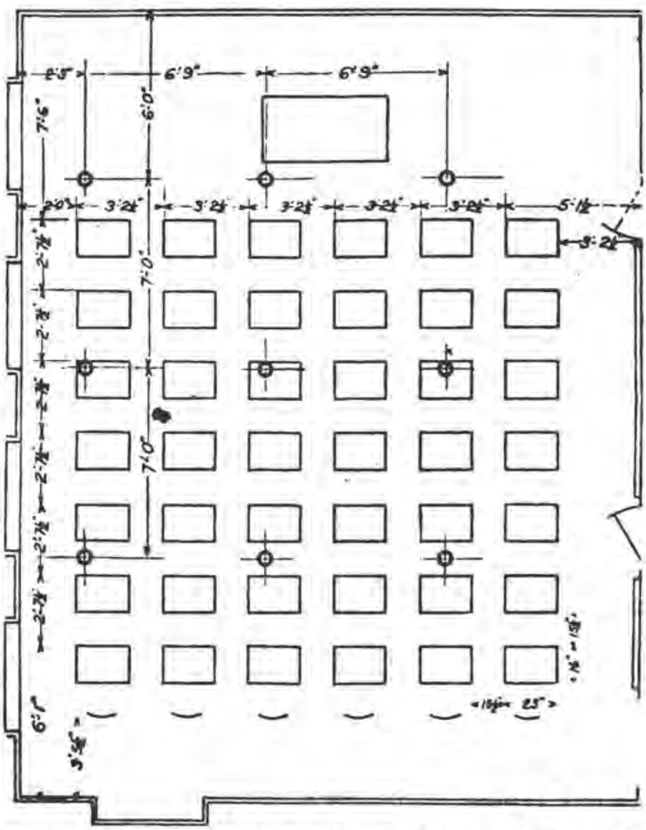


FIG. 6.—Plan of standard schoolroom, showing location of lights. (Boston Public Schools.)

Figure 1 is a diagram or plan of the reflector, and Fig. 2 shows the shade and supporting fixture, the shade or reflector being sufficiently deep to hide the lamp, which was in place when the illustration was made.

The nine fixtures are arranged in rows of three and in such manner that the center of light distribution is slightly to the left of the middle of the room. That is done in order to throw the dominant shadow to the right of the scholars.

The arrangement is shown in the above plan (fig. 6), which has been in use since 1907, when the fixture was selected and the ad-

justments made by a committee of oculists and electricians appointed by the Boston school committee.

Another illustration of a rather typical installation is found at the United States Naval Academy, where the usual study room is 16 by 16 feet, with ceiling height of about 11 feet 6 inches. This room is occupied by two students, who work at a center table with top 3 feet 6 inches square and 2 feet 6 inches from floor. In this case the artificial illumination, which some think is deficient in relation to surroundings, is derived from two 60-watt clear tungsten lamps, each inclosed in a clear Holophane stalactite, hanging 6 feet above the table or 8 feet 6 inches above the floor. These fixtures are 2 feet 8

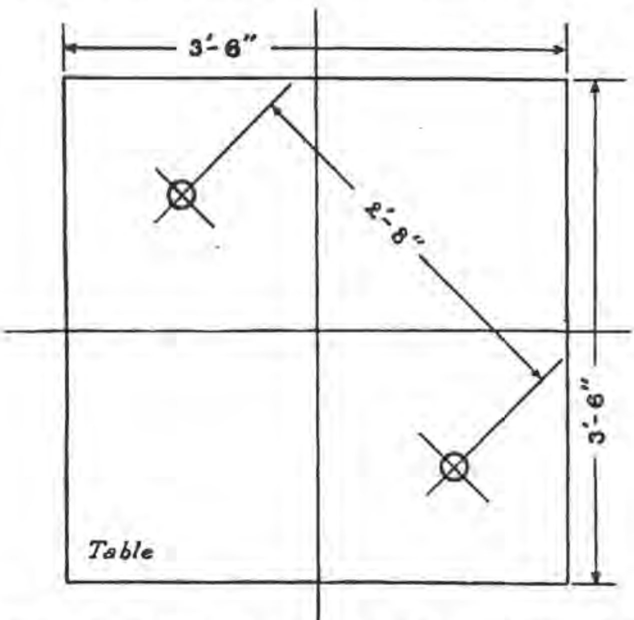


FIG. 7.—Plan of center of room, showing position of lights over table. (U. S. Naval Academy.)

inches apart and are arranged symmetrically and diagonally with reference to the table so that the midpoint of line joining them is over the midpoint of the table. They are suspended by cords from the ceiling, and an asbestos mat is utilized to close the top of each in order to keep out dirt (figs. 3 and 7).

These installations (Naval Academy and Boston public school) are types of what may be called the semidirect system of lighting, or the system depending partially on direct and partially on diffused light, but with the former in greater proportion. There is, however, a semi-indirect system or a system in which, while depending partially on direct light and partially on light reflected from the ceiling, the pro-

portion of direct light is relatively small. From an engineering point of view the efficiency of this system is low when comparison is confined to expenditure of current in relation to illumination of the work or desk. From a mechanical point of view it is also subject to criticism, because it requires more care not only in regard to cleanliness of interior reflecting surface of fixture but also to maintenance of color and cleanliness of ceiling used as an intense reflecting surface. In other words, after installation more care is required to prevent a marked drop in efficiency. In extensive installations, such as at the Naval Academy or in a city's public schools, additional care of fixtures presents quite a problem, and in not a few public schools lack of care has caused within a year a drop of 40 per cent in efficiency even in the case of semidirect installations. However, semi-indirect installations are rapidly gaining in public popularity not only on account of the softness of the light secured but also from the esthetic point of view, and quite a number of medical men, as well as illuminating engineers, believe that greater eye comfort is secured from well-adjusted installations of this character. Probably on account of increased expense in current and upkeep there are very few extensive installations of this system of lighting for the purpose of school work. Where installations have been made for that purpose they are more or less recent and seem to be regarded as in a more or less experimental stage. The complete indirect system, owing to absence of shadow, difficulty in maintaining efficiency of reflecting surfaces, and lack of rather more light on work than on surroundings, has not been generally regarded as suitable for school work. In the semi-indirect system shadows are not abolished in the strictest sense, but they are not ordinarily perceptible to the eye, yet in having the fixture within view the result ceases to impress one as specially unnatural. In fact, so far as limited experience goes there is testimony of the practicability of the best efficiency in these installations from the physiological point of view—that is, from the eye-comfort point of view. However, the subject is left open here, although improvement in the efficiency of lamps has made the additional current expenditure less objectionable, even if relatively the same as formerly, being about 50 per cent greater than is required in the semidirect system. Nevertheless, in the large majority of semi-indirect installations one happens to see the illumination is insufficient for near work, the additional expenditure of current required for that purpose not having been provided, possibly on account of increased expense. Yet, as very many illuminating engineers consider that up-to-date illumination means semi-indirect illumination, this subject can be left to a little more time and experience in use for adjustment. Certainly the reflectors or bowls employed in this system have been rapidly im-

proved, and the tungsten lamp in its present form is making the high candlepower required seem nothing unusual.

In the semi-indirect system the minimum number of outlets, or light units, is four, in the ordinary public-school room, and, as the question of shadow is not involved, the fixtures are so placed that the center of the lighting system is over the midpoint of the room. The lines joining the fixtures make a rectangle with two sides each one-half the length of the room and the other sides each one-half the width of the room. Figure 4 is a plan of such an arrangement.

Each of the light units is made up of a dense opal glass bowl, or inverted reflector, containing in this case a 200-watt clear tungsten lamp. The material used in these bowls should permit the passage of sufficient light to give the bowls, which are suspended 3 feet from the ceiling, the same luminosity as the white ceiling directly above them.

Figure 5 is an illustration of a fixture put forward as adapted to the requirements for the semi-indirect lighting of a schoolroom such as that indicated in figure 4.

In artificial illumination secured by either the semidirect or the semi-indirect system there are important considerations relating to color of surroundings as well as to their finish or character of surface in effect on manner of reflecting light.

Color of walls and of furniture has relation not only to percentage of light reflected but also to confusion of eyes due to disturbances of focus. Such disturbances are very different from the question of focus in relation to distance. They depend upon changes of focus necessitated by the colors themselves. For instance, a red room seems smaller than if it were colored blue. Artists take advantage of this difference in focus required by different colors. They utilize red to make certain portions of a picture appear to stand off from the canvas and they use blues and violets to push back other portions of the canvas. This situation is considered to depend upon association of judgment of distance with degree of effort to secure a focus, the red end of the spectrum, containing rays of slower vibration, requiring more effort than the more quickly vibrating violet and blue rays at the other end of the spectrum. Aside from any question of effects upon the visual purple, no red or blue should be used in tinting the walls of any study room. They tend to disturb orientation and are very trying to the eyes themselves. They represent a variety of marked contrast that seems to follow departure in color of surroundings from the midsections of the spectrum. And in artificial illumination yellow seems to please the eye more than green, but in rooms under natural illumination with opportunity for sunlight effects, green may be more desirable. A light buff has been found the most satisfactory of all colors for study rooms under artificial light. By

its reflecting power it lends itself to the requirement for well illuminated surroundings and by its color it tends to give eye comfort. But all walls should be without gloss. It is the matt surface that prevents sheen or the regular reflection that is trying to the eyes whether it comes from walls or the glazed paper of books. Such a light buff wall reflects about 50 per cent of the light it receives. It is the white ceiling and light buff walls that give bright surroundings and abolish violent contrasts in any acceptable system of artificial illumination.

In the effort to avoid undesirable contrasts it is also very undesirable to have any dark woodwork in a study room. The ordinary deal woods are the best for tables and desks. Such wood reflects about 50 per cent of the light it receives, and thus is in harmony with the walls. The wood should be finished in its natural color and without gloss.

It is in this relation that the blackboard of the night school is so objectionable. Black reflects only about 1 per cent of the light it receives. Such a violent contrast is, of course, reduced when the boards are a dead black and additional illumination is provided for them by special lights. The amount of such illumination may be as much as 60 per cent in excess of that provided for the room as a whole. Roller shades of the same color as the walls should be provided to cover blackboards when they are not in use.

In a number of schoolrooms window-shades are conveniently arranged by having two rollers at each window. They are placed on a board which is at the level of the meeting line of sash. The upper shade is controlled by cord and pulley. This arrangement facilitates the management of sunlight in day schools and of ventilation or air in day or night schools. In rooms used for both purposes the color is often a sage green, as is the case in the New York schools. It would be better in a night school to have the shades about the same color as the walls. In the New York schools hollands have been discarded as material for these shades on account of annoying reflections. Oiled shade cloth of roughened surface has been found much more satisfactory.

The amount of light on any surface is generally expressed in foot-candles, a foot-candle being the illumination derived from one standard candle at the distance of 1 foot. One quite generally finds it stated that an illumination of from two to three foot-candles is usually enough to read by.

However, there is no hesitancy in stating that in making plans for the proper illumination of the table in a study or of desks in a schoolroom provision for from 2 to 3 foot-candles will be found insufficient in practice. This is due to several causes, among which are the hyperopic condition of young eyes, the drop in power of filament, and chiefly the accumulation of fine dust on fixtures even under ordinary

care. This drop in efficiency may be considered to average about 20 per cent in the semidirect system. A much wider variation may be expected in a semi-indirect system. This situation emphasizes the great advantage to be obtained from reasonable supervision with periodical cleaning.

Experience seems to show that in a schoolroom average type seems well illuminated when the foot-candles are not below 2.5, and that, for ordinary prolonged study, comfort is found at from 2.5 to 3.5 foot-candles. Therefore, in view of the 20 per cent drop in efficiency common in all installations, it is considered advisable for provision to be made for 3.5 foot-candles at the start. In semidirect lighting about 66 per cent of this would be calculated from distribution curves to be derived directly, and the rest as incident to the required illumination of surroundings.

The standard of 3.5 foot-candles from new installations accords with experience at the United States Naval Academy and fairly well with results at the New York and Boston public schools. At the Naval Academy an initial illumination of about 2.3 foot-candles was tried and in the Boston schools about 2.5 foot-candles. Such installations did not provide for drop in efficiency, and acuteness of vision falls rather rapidly as the illumination goes below 2 foot-candles. At the Naval Academy it became necessary to increase the illumination one-half, and it is understood that about the same change has been more or less in progress in the Boston schools, 60-watt lamps taking the place of 40-watt lamps. In the New York public schools it seems that 3.2 foot-candles were obtained when all equipment was new and clean. In study rooms at the Naval Academy the illumination of the walls at the level of study table is about 1.5 foot-candles with new installations, and the reading area is a circle 8 feet in diameter.

Methods employed in the calculation of foot-candles to be expected from any given illumination are very interesting and very valuable. They can be found in any work on illuminating engineering or in the data on illumination put out by the engineering departments of electric companies. It is sufficient to state that each shade or reflector has with its lamp a certain distribution curve by the use of which it can be located with reference to desk or table to give the required number of direct foot-candles, and that studies of photometric curves can be made to give a very good idea of the proper selection for the illumination desired. However, in investigations with view to extensive installations, such as for public schools of a city, wires are stretched horizontally at different levels from wall to wall and different fixtures are tried at varying levels until desired results, as shown by photometer, are obtained. Of course, there are very many varieties of shades or reflectors on the market, designed for different requirements. However, in meeting the requirements

of a study room it is the all-inclosing shade, or the deep bowl of prismatic glass, that is most satisfactory in semidirect lighting. The bowl should have its interior surface without polish, as otherwise the work is liable to be illuminated in streaks of varying foot-candles, a situation very detrimental to eyes and often produced by the polished shades of desk lamps. A desk lamp should never be allowed in a study room. It can be too readily utilized to overilluminate the work and is too frequently employed at the expense of general illumination, excessive shading being required as the light source is close and very liable to be directly in the line of vision. The desk lamp has been a fruitful source of eye troubles and is at all times at least equivalent to a side light. It is an expression in a study room of improper overhead lighting.

In this article effort has been made to emphasize the important place in sanitation occupied by artificial illumination. Food, air, water, and drainage occupy prominent places in any work on hygiene, and not a little appears in such works on the relation of sunlight to body metabolism; but one looks in vain in that direction for a comprehensive exposition of the sanitary relations of artificial illumination to the preservation of that wonderful and most valuable special sense known as sight. Proper illumination is a fundamental sanitary requirement, and education in matters of health should be made to include care of the eyes—the windows through which we see what the mind, the heart, and the imagination are gifted to see.

CONCUSSION OF THE BRAIN.[1]

By J. CHALMERS DACOSTA, Assistant Surgeon, Medical Reserve Corps, United States Navy.

This is a subject of great interest, full of absorbing problems, and, though a matter of frequent debate by surgeons, pathologists, and neurologists, is not as yet worn threadbare. It is not only the immediate phenomena of concussion which I shall consider, but I propose saying something of some of the numerous results of concussions, strange conditions of mind and body, frequently misinterpreted and not unusually failing of recognition as traumatic states.

What is concussion of the brain? We must not confuse the lesion with the force that produces it. A shake, a blow, a jar, and oscillation are the concussing forces. The condition produced by the shake, the blow, the jar, or the oscillation is the condition known as cerebral concussion. What has arisen in this state has long been a matter of dispute.

[1] Lecture delivered before the United States Naval Medical School, Washington, D. C., Mar. 10, 1916.

For many years the condition was supposed to be one of disarrangement from molecular vibration. It was supposed to be similar to the condition of a magnetized bar of iron after being smartly struck with a hammer. You all know that a sudden blow demagnetizes it, not only just at the point struck, but throughout the entire bar. This was the view commonly put forth when I was a student of medicine over 30 years ago.

Then came the notable studies of Duret. He held that, in concussion of the brain, there is always actual physical injury demonstrable by necropsy; that a blow upon the head causes a wave of cerebrospinal fluid to tear across the brain; that this wave recedes, flows over again, though less strongly, again recedes, and so on, and finally comes to an equilibrium. Duret's view was that these sudden and violent waves of cerebrospinal fluid tear and lacerate nerve tissues and blood vessels. This belief once largely dominated modern thought, and, in a sense, it dominates it to-day, for, though the idea that waves of cerebrospinal fluid do the damage has been pretty generally abandoned, the opinion is widespread that concussion means, and always means, structural damage to the brain, its vessels, or both.

My dear old master, Prof. Keen, taught that in concussion, at least in severe concussion, there must be laceration of the brain. Prof. Kocher, of Bern, regards concussion as synonymous with cerebral contusion.

In order to obtain clear conceptions, we should recall that contusion is a condition of blood extravasation due to rupture of minute vessels, the nerve fibers not being torn, and that laceration is tearing of small blood vessels and also of nerve fibers.

It seems a venturesome thing to dare to differ from two such masters as Keen and Kocher, and probably I would not dare to, were I not able to cite the late Prof. von Bergmann as the exponent of the theory in which I believe.

I have never been able to believe that real, uncomplicated concussion must of necessity be an expression of laceration or contusion. Slight cases certainly are not. The symptoms are too trivial and transitory. Anyone who has been bowled over on the football field and struck his head, has seen stars, has felt giddy, has been nauseated, has perhaps vomited, yet in a few minutes has returned to play. Such symptoms point to concussion. In undoubted concussion like symptoms exist, only they are much intensified. It is quite impossible to assume that in such a slight case, with such rapid reaction, and such freedom from subsequent trouble there can be organic injury. Necropsies have been made upon human beings who died of concussion, have been made with care, and made by masters, and yet physical injuries were not demonstrated. Then, again, animal ex-

periments point to the same conclusion. By repeated light taps with a hammer on an animal's head, symptoms of concussion can be produced, and by continuing the tapping, the animal may be killed, and yet a careful postmortem may fail to show a tear in a single vessel, or rupture of any nerve fibers.

You observe I say necropsy "may fail to show." That it ever fails to show is proof of the case. In many cases it will show lesions, but it does not show them in all cases, and thus we are brought to the crux of the controversy.

What has confused the matter is this: When a man, after a blow on the head, exhibits symptoms of concussion and later dies, and examination shows no fracture and no hemorrhage from a large vessel but does show laceration of the brain, with small multiple hemorrhages, the examiner jumps to the conclusion that all deaths in similar cases will exhibit like lesions, and that concussion must mean laceration of the brain. But we know that after head injuries men have exhibited the symptoms of concussion and have died, and yet no such lesions could be found. So it is evident that concussion can kill without such lesions; hence, even though such lesions may be frequently, or even usually, present, they are not invariably so, and they do not constitute the essence of concussion. You may have concussion without such lesions. You may have concussion with such lesions. When these lesions exist, they are complications. They are due to the same force which produced concussion, but are not lesions of concussion.

Even when a man dies after a blow upon the head and laceration is found, it may have been the concussion rather than the laceration which killed him. A man who receives a bullet wound of the brain may die rapidly of the concussion rather than from the gross damage inflicted on cerebral vessels and brain structure.

We, therefore, assert that there is such a thing as pure concussion, a condition without tears of blood vessels or brain fibers; that the same force which produced concussion may induce laceration, contusion, or both. In one case you may have pure concussion; in another, concussion with laceration; in another, concussion with contusion. Because the same cause may produce these different conditions is no sign that the conditions are identical. A blow upon the abdomen may rupture blood vessels and cause fatal hemorrhage. It may cause sudden death by inhibition, no lesion being discernible at necropsy. Surely these two conditions are not identical. I am convinced that there is such a thing as concussion without gross lesion. The original blow is the cause, and it acts not by surging waves of cerebrospinal fluid but by momentarily displacing the brain.

As Prof. von Bergmann insisted, the force displaces the brain. The displacement is momentary, and the brain promptly resumes

its normal place. The force acts on the entire brain, not only upon a part of the organ. It acts upon the cortex, the corona radiata, the medullary centers. There is a primary stimulation and a secondary depression. In very slight concussion there is temporary stimulation and little or no depression. In severe cases there is prolonged depression. If depression is sufficiently severe, exhaustion takes place, paralysis arises, and death occurs.

When the cortex is stimulated, the man sees stars, colors, flashes of light. He hears roaring in the ears. In slight cases, the condition is very temporary. The patient is soon over it, feeling for a time light-headed, confused, giddy, and nauseated. In more marked cases, the depression is marked and of longer duration, and the patient is, for some time, dull, stupid, and blunted. He originates no idea. He gives utterance to no word, except, perhaps, a monosyllabic response to a peremptory question, and the answer may be accidentally in accordance with facts, or may be wrong, and even absurd. In order to rouse the man to answer at all, it may be necessary to pinch him or shake him. In severe concussion, there is, for a time, actual unconsciousness.

The primary stimulation of the medullary centers is of much longer duration than the stimulation of the cortex. It is medullary stimulation which produces slow pulse. Slow pulse is a normal feature of concussion.

Let us suppose a very severe case. The patient is unconscious. There may or may not be motor paralysis. Paralysis is unusual but does occur. The primary stimulation of the medullary centers, which caused slow pulse, has given way to depression, which causes rapid pulse. Rapid pulse is a sign of imminent danger. It means depression. Depression may, at any moment, lead to exhaustion, and exhaustion will mean paralysis of the centers and death.

Everyone who is handling cases of concussion knows that it is the cases with rapid pulse you have to be most afraid of, and not the ones with slow pulse. The slow pulse means stimulation of medullary centers; the rapid pulse means depression, threatening exhaustion. When a man is about to die from concussion of the brain, the pulse runs away, and when he is doing pretty well, the pulse is apt to be in the fifties, or even less. I consider the pulse rate as of very great significance in estimating the severity and the immediate danger of concussion of the brain.

This whole condition, you see, varies notably from compression of the brain, although often, for an hour or two, we may be in doubt as to which state we are dealing with. By compression of the brain, we mean the result of the lessening of the capacity of the cranial cavity. It has been shown experimentally that if you inject into

an animal's cranium an amount of wax which occupies 5 per cent of the cranial cavity, the animal will become comatose, and if you inject an amount of wax which occupies 8 per cent of the cavity, the animal will die. Compression of the brain, as does concussion, involves the entire brain, although it may involve more particularly the region that is exactly in the neighborhood of the compressing force; but the whole brain is always in the trouble.

Whereas concussion means primary stimulation and secondary depression of the nerve elements, compression means nutritive failure from interference with the circulation of the brain. When the capacity of the cranium is lessened, that cavity can not hold as much as it did before, and as nerve element itself is not compressible, other elements must be pressed upon. First, cerebrospinal fluid is displaced from the cranium into the spinal canal; that is, it is displaced if the foramen magnum is not blocked by the brain stem being jammed down into it. Such blocking of course effectually prevents transfer of fluid to the spinal canal. The pressure next comes upon the veins, and next upon the arteries. In the stage of fully developed compression there is an insufficient blood supply to the entire brain, and, as a consequence, rapid nutritive failure results. In many respects compression resembles concussion. In well developed compression there is depression of the cortex and stimulation of the medulla. The cardiac center, the respiratory center, the vasomotor center, are stimulated. The respiratory center is stimulated by carbon dioxid, and stertorous breathing occurs. The stimulation of the vasomotor center and of the cardiac center means slow pulse with high tension. Sometimes the convulsive center is stimulated; then convulsions occur. Suppose exhaustion arises. Then we note rapid pulse, Cheyne-Stokes respiration, and, before long, death. Although the symptoms of compression and concussion resemble each other in many ways, the conditions are essentially different.

In a slight case of concussion, a man may or may not fall. He becomes pale, frequently ghastly pale, weak, giddy, nauseated, and confused. The pulse is slow. He very soon reacts. It is all a matter of minutes, and as he is reacting he is apt to vomit.

These light cases are extremely common. During my 26 years active surgical experience with the Philadelphia fire department, I have seen hundreds of light concussions get rapidly and completely well. But I have also seen very serious consequences resulting long after apparently trivial concussion.

How about a more severe case? The individual is in a state of complete muscular relaxation. He can not stand up. He falls down and lies in a state of immobility, not originating an idea, not speaking a word, not moving a muscle. If you pinch him, he may move a limb; if you speak to him loudly and peremptorily he may answer

in monosyllables, although his answers are just as apt to be incorrect as correct. You lay your hands on an extremity and it is cold to the touch. You look at the patient's face and the skin is pallid. You touch the face and find it is cold; it lacks the flush, it lacks the heat that exist in compression. You feel the pulse and find it slow, but it is without the high tension of compression. The pulse of compression is a slow and high-tension pulse. The pulse of concussion is a slow pulse without such high tension. The man is not snoring; he has not stertor, as in compression. Respiration may be deep or superficial, rapid or irregular.

There is nothing characteristic about the respiration of concussion. The victim seems unconscious when you look at him from a distance, but he seldom is; usually you can evoke some response from him. In a very severe case of concussion the man will be in actual unconsciousness, and in such a case the surgeon finds himself at a loss to determine whether there is a grave brain injury, requiring an operation, or a concussion from which reaction will soon be noted. In severe concussion urine passes involuntarily. Paralysis of the face or extremities is extremely rare, although it may occur. If it does occur it is temporary. The temperature during the stage of marked concussion is subnormal. The pupils in concussion may be equal; may be unequal; may be dilated; may be contracted; but they always react to light. That is the essential pupillary phenomenon of concussion—that the pupils, whatever the condition of equality, or dilation, or contraction, always react to light.

In the very dangerous cases there is not slow pulse but rapid pulse. The man is unconscious, completely so, and has a pulse that is rapid, small, weak, and irregular. You know that he is in grave danger of death.

The above description exhibits the clinical aspect of concussion. When you see a man, after a head injury, unconscious, with a slow pulse, or a pulse that grows in rapidity, you find yourself in doubt as to what is the matter—whether there is pure concussion, whether there is laceration, contusion, or growing hemorrhage. The essence of concussion is that the marked symptoms are all temporary. Pure concussion is temporary, it presents marked phenomena for a short time—it is all a matter of minutes, or, at the most, of a very few hours. In a brief time the man will react or will develop symptoms which should put the surgeon on the right track.

Let us suppose there was a hemorrhage from a large blood vessel. The pulse would grow slower and slower. The tension would become greater and greater. The unconsciousness would be more and more profound. Paralysis of a limb, of the face, or hemiplegia might arise. If there was not unconsciousness at the start coma would come on and the pupils would dilate and fail to react to light and would in

many cases become unequal. Then the surgeon would know that there was more than pure concussion—that there was a grave physical injury, probably with a growing hemorrhage.

Suppose there was a laceration of the brain. The victim would emerge partly from the condition of concussion. His improvement would not be continuous beyond a certain point. He would then lie curled up in bed, the legs flexed on the thighs, the thighs drawn up to the abdomen, the elbows flexed, the hands drawn up clenched, the eyes shut, and probably twitches and quivers would be observed running over the muscles and involving muscle groups. If you tried to open an eyelid, endeavored to extend an arm, or to straighten out a leg, the victim would resist impatiently with all the muscular force he had. Then you could be sure that there was more than concussion—that there was probably laceration of the brain.

So it becomes evident that in any of the graver cases of concussion the surgeon has to wait, observe, note. It will not require many hours of waiting. As a rule, two or three hours will clear up the whole situation. A surgeon must not open the skull of a man with pure concussion. It would not do the patient any good, and the surgeon would not know where to open or what to do after he had trephined. The skull is to be opened only when there is definite structural damage and not always even then. Always bear in mind that the essence of concussion is the transitory nature of the phenomena.

I have spoken about making a prognosis by the pulse, but the prognosis is always more or less uncertain. A man may appear to be doing very well for 20 or 30 minutes, and may then suddenly go to the bad. He may look as if he is about coming out of unconsciousness, and then the pulse may suddenly jump up. When there is prolonged concussion, when the symptoms last more than a comparatively few minutes, or, at most, two or three hours, the chances all are that there is more than concussion, and that a very serious lesion exists. After the characteristic symptoms of ordinary concussion have completely departed, say in 12 to 24 hours, the patient is usually troubled with headache, is in a condition of lassitude and weakness, has no energy; his temperature is apt to go up a degree or two, and sometimes he becomes delirious. Mental wandering is especially common after a railroad accident, the mind reverting to the horrors of the accident; he is sleepless and in some few cases develops temporary mania. A few days after a concussion the average man seems entirely normal, he leaves the hospital, and we seldom see him again. The recovery may be complete and probably usually is so.

I am perfectly free to admit that a man may suffer a severe concussion of the brain, get over it entirely and never have any trouble. Yet in a great many cases recovery is not complete. Some ill consequence may follow the concussion—may follow it soon, may follow

it comparatively soon, or may follow it long afterward. I have been observing head cases for more than 25 years and have become entirely convinced of the frequency of bad consequences. Six or eight months may pass after a concussion before something wrong is noted—something you can put your finger on. That something may be vague or may be definite. It may have been present a good while before it was recognized.

The most common ill consequence to be noted is a change in character. There is no more sensitive test of the mental operations than character. Dr. Horatio C. Wood said that many changes so subtle as to escape entirely measurement or recognition by ordinary methods are registered with surprising accuracy on the dial plate of human character. There is a change observed in the man. He is not the same man he was before the accident. I have seen this over and over again. For instance, the man who, before the concussion, was an ordinary, modest-minded citizen, becomes extremely egotistical. It is a curious thing. It shows how some things in nature are maladjusted. The change in character is always for the worse and never for the better. You never see a man who, previously, was egotistical, becoming meek and humble after a concussion. He always gets worse. The victim of the change in character becomes offensively egotistical. No matter how truthful he may have been before, he becomes a romancer, and often a shameless liar. He tells wonderful lies. He is sure to become incurably irritable. To estimate the degree of change brought about in character, we must know what his character was before the accident. When you estimate character, you do not compare a man with an ideal character, but with himself—with his own previously recognized state of normal well-being. For instance, if you were to find that a coal passer could not speak the Greek language, it would not attract any interest in your mind. But if you found that the professor of Greek in Oxford University could not, you would consider that a very decided change. Whatever the man was before, when the change comes he is egotistical, mendacious, irritable, horribly selfish, and extremely censorious.

He is prone to outbreaks of the most violent rage on the most insignificant grounds. These causeless rages almost suggest maniacal paroxysms. Some form of loss of memory is the rule. Epilepsy may arise.

Such a condition unfits a man for his duties, for his work, for discipline. It breaks up all the regular habits of his life. He becomes extremely susceptible to alcohol—even small amounts will overturn his mentality. He becomes highly susceptible to the heat of the sun. Service in the Tropics would be impossible to such a man. He is unable to perform any prolonged physical effort, and is totally un-

equal to any mental effort. Such a man is apt to get into trouble with the police and to commit crimes of violence. I do not mean to say that such cases are very common, but I do say they are not very uncommon. They are most apt to be noted after severe concussion but even slight concussion may leave as a legacy some such evil state.

In such cases, a change must have taken place in the brain. What it is and how it was brought about, nobody knows, but the concussion certainly caused a change in the subtile chemistry of the nerve cells. It is something beyond our ken, and in attempting to recognize it, the microscope is found to be the tool of a bungler. The change is there forever. It may never go beyond this point. It may eventuate in actual insanity. Some concussions have left the victims with persistent headache—perhaps persistent localized headache. A great many are left with insomnia, and suffer torture and sleeplessness for years. Some are mentally depressed to the verge of melancholia.

Vertigo is a very common result. I have spoken of the susceptibility to alcohol, to the sun's rays, and to mental effort. The memory defects which are sometimes encountered are very interesting. Few things in psychology are more interesting than memory. It is a wonderful thing. The more we think of it, the more wonderful it is. It consists primarily in carefully concentrated observation—that is, the registration of the impression. Then follows the reproduction of the impression at will, and then the localization of that reproduction in the past. For instance, if something happened to me two minutes ago, and I recall it now, even though I can tell what happened, if I can not tell when it happened, that memory is of little use to me. I have got to localize that reproduction in the past—whether 2 minutes, 10 minutes, 10 years, in boyhood, or when. The registration, the reproduction, and the localization in the past are the chief elements in memory.

When we analyze the defects of memory, we find a man may fail to register things. He does not know what he had for breakfast an hour ago. He does not know what was said to him two minutes ago. And yet he remembers and talks about the events of a month or six months or a year ago, or of his boyhood. He is registering nothing now. The registering part of his memory is at fault. When reproduction is at fault, he can not remember anything correctly. He tries to pull something out of memory and can not do it to save his life. If he knew a foreign language, he has forgotten it. He forgets a lot of words in his own language. His vocabulary becomes very limited. He can not reproduce the old impressions. He does not know his old friends when he sees them. When the failure is in the localization in the past, he may know that such a thing has been, or was said, but he has not the faintest idea when it was, whether it was

said 2 minutes ago or 20 years ago. You may find any one of these defects, any two of them, or all three of them.

There is a very curious and important thing about memory after concussion. It is a thing that has great medico-legal significance. A man may forget absolutely all about the accident, and if soon after the accident he has no memory of it he will never remember it in the future. If I see a man in the hospital who assures me he has no memory of an accident having happened, or that he just remembers that something—he does not know what—took place, and knew nothing else until he found himself in the hospital; if that man subsequently goes into a court of law and describes what he remembers about that accident, I know he lies, for the memory of it never comes back. When there is no memory of the accident, there never was mental registration of the accident, and if it was never registered it can not come back. The man may simply know he is in a hospital; the last thing he remembers may have been walking in the street. Such a hiatus as that is never filled up. There is something more remarkable still. A man may forget a period antecedent to his accident; he may forget the period of 10 minutes which preceded, or hours, or days, or much longer. For instance, a battalion chief of the Philadelphia fire department went to a fire half a mile from his engine house and was directing his men in the street when an outside elevator fell and struck him on the head. He never remembered anything about the accident. He had no memory of the period before the accident from the moment he stepped into his wagon and started out of the door of the fire house. He did not even remember being in the street going to the fire, and he never did remember anything about it. He had lost that much of his antecedent memory. Once-registered facts had disappeared. Such a loss—loss of a period before the accident—may subsequently be recovered. The fireman did not recover it. Others do. Such things were once registered, are still there, and perhaps some day may be reproduced.

I had a still more remarkable case. A man entered the Blockley Lunatic Asylum many years ago when I was a resident physician. We knew nothing about him whatever, and his mind was an absolute blank. He had been found wandering around in the street. We found, in his clothing, an employee's pass of a railroad. We wrote to the superintendent of the road and found that the man was one of their old and trusted locomotive engineers, and that he had a wife and children. He had had a head injury which was not considered grave; had completed his run, had gotten off the locomotive after helping to clean it up, and had never been seen since by anyone who knew him, until he came to us. The memory returned slowly and in two directions. He never knew anything of the accident or

the period subsequent to the accident, but the period before the accident gradually came back to him, and in a strange way. I was very sorry for him. I have always liked railroad men and I took a personal interest in him and I used to take him out walking in West Philadelphia. One day he stood and looked down at a Pennsylvania Railroad train and said, "I used to run an engine on that road;" that was the start of the reeducation of his memory, and it came back in two directions; it filled in from the accident back, and from infancy forward. When I lost sight of him the two trains of recollection hadn't quite met, but were approaching. There was still a hiatus, or blank, of some years.

I had a patient who was a miner. He fell into the mine shaft. He did not fracture the skull, but had a very severe concussion of the brain. He was unconscious, was taken to a hospital, and "came to" in the course of an hour or so. There was no evidence of any organic lesion, but, to the surprise of everybody, he did not know a soul, not even his wife or children. He did not know who he was; in fact, did not know his own name. It was necessary to absolutely reeducate him. He went on that way for five years, and finally developed an education for this part of his double state of personality. He came to know the people he lived with and other people. He learned how to read again, but never did read very well. He did not take any interest in public events, because he had forgotten what he had known before. A partial paralysis of the left leg slowly developed and hallucinations of sight and hearing began. He was finally brought down to the Jefferson Hospital, with the suggestion that I treat him. Because of a suspicion that there seemed to be some depression of the skull over the right motor area, and because of the palsy of the left leg, I decided to trephine. I opened the dura and found only a very few spider-web adhesions between the membranes and the cortex. I separated them as a mere routine, and told the family that the operation would do no good whatever. When the man came out of the ether he asked to see the doctor, and when I came he requested me to ask the mine superintendent to keep his job for him. He supposed that he had just been picked up from the shaft bottom. All the period of five years between the accident and the operation was wiped out as completely from his memory as if it had never been. He knew his wife because he had known her before. He never did remember anybody that he had met during this five-year period. And we had a great deal of trouble about a child of his that was over 4 years of age—trouble in trying to explain the situation to him and to set things all right. He had to get himself educated again as to what had happened during this five years. He had two independent sets of memory, with two independent conditions of

consciousness, and neither one touched the domain of the other. It was a case of double personality due to concussion. To-day he runs a store, attends to the accounts, reads the newspapers, is happy and comfortable, but has never remembered a fractional part of a minute of those five years. And during those five years he never remembered anything about the previous part of his life. That is the sort of thing that may come to the memory and the person after concussion—sometimes even after slight concussion. You often see an individual who, previous to a concussion, gave no sign of being hysterical, and after a concussion shows marked signs of hysteria. This is traumatic hysteria. The individual had latent hysteria anyhow, and the injury only awakened the latent condition into an active state. An injury can not create hysteria. It can appear to cause it only when there is the basis for it. A man may have latent hysteria and long suppress it, suffer from an injury which makes suppression impossible, and then exhibit all the hysterical stigmata. Zones of anesthesia and hysterical palsies have led again and again to confusing the results of concussion with real organic disease. There may be clavus, there may be a globus that simulates stricture of the esophagus, there may be constriction of the visual fields and alteration of the color fields.

The state in which a man is listless and indifferent, has no energy and no originating power of mind or body, in which he has failure of sexual power, backache, headache, indigestion, and constipation, and with which he usually has exaggerated reflexes, is known as neurasthenia. When due to an accident it is traumatic neurasthenia. Concussion of the brain and sprain of the back are the commonest traumatic causes. Traumatic neurasthenia may exist with or without hysteria. It used to be believed that concussions were responsible for organic diseases of the cord. The condition was called concussion of the cord. Such concussion seldom causes organic disease. Exaggerated reflex is common in certain organic diseases, but is also common in neurasthenia, a functional disease. In the exaggeration of neurasthenia the reflex can soon be exhausted—in organic disease exhaustion is far less easy.

Actual insanity may arise after concussion. It is uncommon, but it does happen at times. When a resident physician in a lunatic asylum I made studies and reached the opinion that less than 5 per cent of the patients could be suspected of any traumatic cause. The family likes to believe that the insanity is due to injury. They do not like the stigma of ordinary insanity. Even in a great majority of the cases supposed to be traumatic there is hereditary or acquired predisposition. The old idea, that you have to have insanity in the blood—insanity derived from your ancestors—certainly is not true,

although hereditary predisposition is often there. A predisposition to insanity can be acquired.

Let a man have no education of his will. Let him give way to any emotion that rises in him. Let him become one of those disturbing factors that are so common in modern life. He is a man with a predisposition to insanity. The predisposition can be created by alcohol, fear, worry, by a lot of disturbing emotions. It does not have to be hereditary, although it frequently is.

Further, I have observed that when insanity followed concussion of the brain, one of two things was noted: Either the man had a hereditary or acquired predisposition to insanity before the head injury, the head injury having been simply the spark that lighted the powder; in such a case, the insanity would, sooner or later, have come anyhow. Or you found that, although the man's insanity did not develop for months, perhaps for many months after the head injury, examination of the record of the period intervening between the head injury and the insanity disclosed evidence of the peculiar change of character of which I have already spoken. If insanity arises months after an injury, I would not think of assigning injury as the cause, unless I found evidence of this intervening change of character. When the head injury acting on the predisposed brain was the spark which lighted the powder of insanity, the insanity came quickly after the injury. When a head injury was the sole cause, the insanity may have come on months after the injury, but there was a striking antecedent change of character. If a man remains free from mental trouble for months after a head injury, and then develops insanity, and if, between the time of the head injury and the time of onset of the insanity he had shown no notable change of character, the head injury did not cause the insanity. That question comes up sometimes in cases of legal remuneration for head injuries. In such insanity there may be melancholia, unsystematized delusions of various sorts, and suicidal propensities. There may be mania, a condition of excitement, violence, rapid talking, and incoherence. There may be hallucinatory conditions simulating paranoia. There may be a condition resembling but not identical with paresis. Syphilis is the cause of true paresis. Without syphilis, there is no paresis. So-called traumatic paresis is not paresis at all, but a condition which mimics paresis. The most common mental trouble after injury is confusional insanity. This is a condition of mental confusion in which a man is entirely out of relation with the environment, in which he has incoherence of speech and confusion of thought, and in which he has forgotten most things. He is not violent or highly emotional except perhaps he is liable to causeless anger. A not uncommon condition resembles or is identical with

Korsakoff's psychosis. In this there is multiple neuritis plus mental confusion, with gaps in the memory which are filled by spontaneous fabrications. It is not that the man invents lies, but that out of the amplitude of previous impressions, all sorts of things crop into the gaps in his consciousness, and he makes the most improbable and absurd statements in the midst of his confusion.

You all know that after a puncture of a certain portion of the floor of the fourth ventricle sugar appears in the urine. This is called puncture diabetes. After concussion of the brain, sugar frequently appears in the urine. The cause of this has been made evident only recently. Not long ago it was said that the diabetes was due to vasomotor disturbance, which flooded the liver with blood and took quantities of glycogen into the circulation. But now we can say that this view is incorrect.

What is the modern conception of diabetes? Diabetes is a disease due to the lack of coordination between the functions of the various ductless glands. Diabetes may be produced by disease of the islands of Langerhans in the pancreas, by puncture of the floor of the fourth ventricle, by administration of excess of carbohydrates, by disease of the thyroid, the adrenals, or the pituitary gland. We know that when we treat a man for asthma by adrenalin, diabetes may arise. When we give phloridzin to test the functional capacity of the kidneys, sugar appears in the urine. It is entirely probable that all these conditions are explicable on the one hypothesis—lack of coordination between the ductless glands. From the islands of Langerhans comes an internal secretion which lays its control on the metabolism of carbohydrates. If that secretion is insufficient, the tissues are unable to assimilate carbohydrates, the carbohydrates appear in quantities in the blood, the tissues themselves break down, the glycogen stored up in the liver is swept into the circulation, and the individual has diabetes.

One school believes that true diabetes is due, and is only due, to organic disease of the islands of Langerhans in the pancreas. But when we come to reflect that the administration of adrenalin puts sugar in the urine, that pituitary disease may do the same thing, that thyroid disease may also do it, we must conclude that these secretions are antagonistic to the internal secretion of the pancreas. If there is enough secretion from any of them, it will antagonize the pancreatic secretion to that degree that the tissues no longer assimilate carbohydrates.

It may be a matter of a few hours, days, weeks. or months that such antagonism to the function of the pancreas may last without permanent harm, but sooner or later the pancreas itself will develop organic disease. When it does so, true or organic diabetes begins. There are a good many forms of diabetes, and if any one of these

forms persists for a long period, it may be followed by the genuine diabetes characterized by organic disease of the islands of Langerhans. When sugar appears in the urine after a head injury, it means that there is irritation of the floor of the fourth ventricle, and that, as a result of the irritation, the nerves which go to the suprarenals have caused an increased flow of suprarenal extract, which we know makes sugar appear in the urine. Whenever a concussion, a depressed fracture, an abscess of the brain, a tumor of the brain, or anything else, affects radically the floor of the fourth ventricle, sugar is apt to appear in the urine. Because of the fact that there is stimulation of the adrenals from traumatic irritation of the fourth ventricle, an excess of adrenalin enters the circulation and temporary diabetes arises, but the essence of this traumatic condition is that it is entirely temporary. Anybody who takes the trouble to measure the urine after concussion of the brain will be struck with the frequency of polyuria. I have seen a man, after the removal of a bullet just above his cerebellum, pass 120 ounces of urine a day for several days. Such polyuria indicates that there has been some jostling, jarring, compression, or irritation of the pituitary body, and that the posterior portion of the hypophysis cerebri is now furnishing excessive secretion, which secretion causes polyuria. It is more common after fracture of the base than after pure concussion, and the probabilities are that when it occurs after a fracture of the base of the skull that there was actual damage to the hypophysis cerebri.

These recently ascertained facts about ductless glands clear up some of the disputed and doubtful questions relating to concussion of the brain. If you will pardon me for introducing the hackneyed topic of concussion, perhaps you may be inclined to admit that there is much food for thought and inspiration to investigation in the question of the relation of these mysterious ductless glands to even such an every-day injury as concussion of the brain.

THE ATMOSPHERE AND ITS RELATION TO THE HUMAN MECHANISM, WITH SPECIAL REFERENCE TO THE NAVAL SERVICE.[1]

By R. C. Holcomb, Surgeon, United States Navy.

ACCIDENTS TO SUBMARINES.

The problem of the submarine is most interesting to the sanitary officer in its aspect as a habitation. The Black Hole of Calcutta or the ship *Londonderry*, with its battened-down hatches, find their

---

[1] Within the past 10 years the naval sanitarian has come face to face with new problems in relation to the atmosphere. In the past he has confronted the problem of more men per cubic foot of habitable air space than pertains in almost any other occupation. But now with the development of aeronautics the naval personnel ascend to a great atmospheric tenuity; with the development of deep diving they descend to atmospheric pressure equivalent to ten times the pressure at the sea level; while within the submarine they are confronted with a reduction of oxygen content and a high concentration of human and chemical air vitiation.

nearest approach to possible repetition within the hull of the submarine. There have been occasions when some unknown accident has occurred, but as all the occupants perished or the boat was never recovered we have no record from which to judge how long the occupants were able to survive, as occurred in the British *A-7* and the United States *F-4*. But there have been occasions when the boats which have sunk have been salvaged with some of the occupants still alive or, as in the case of the Japanese *No. 6*, they have left some record from which an idea might be gleaned of the length of time they were able to exist.

I have selected five accounts of accidents, three of which are specially interesting because of the limit they place upon survival after accident. They are taken from press accounts of the accidents and must therefore be viewed with some reservation, particularly so in the case of the *Minoga*, from the standpoint of the character of the gas supposed to have caused the unconsciousness of the men on board.

1. The Russian submarine *Minoga:* The accident was said to be due to the presence of a bundle of signal flags in one of the ventilators in such a way that the seaman intrusted with the duty of screwing it up previous to plunging might think he had duly turned it home, while in fact it was not made water-tight, and the gradual inflow of water altered the trim and caused the submarine to plunge suddenly headlong. The weather conditions were favorable, and the vessel was raised nine hours later. When the after hatch was opened three men staggered out, barely able to crawl. The captain and 15 of the crew were said to have been unconscious when rescued from the after part of the vessel. There remained only the coxswain, who was in the conning tower amidship. To get him out took another three hours, but the coxswain, when relieved after 12 hours' confinement, *was in the best condition of any of the crew.* When they were submerged the crew suffered from the fumes of chlorin gas (*sic*) given off by the accumulators. The three men who crawled out unaided from the after hatch and the coxswain, who had been confined in the conning tower three hours longer than his mates, were apparently out of the reach of the chlorin-gas fumes; the latter appears to have had more and better air to breath. All recovered from the effects of their terrible experience.

2. The German submarine *U-3:* A remarkable accident took place on the German submarine *U-3*, January 20, 1911. It was established that the accident was due to the flooding of the after compartment of the *U-3* by failure to close the gate valve of the after ventilating tube when preparing to dive. The submarine sank at about 11 o'clock in the morning, and by about 7 o'clock 25 of the 28 men of the crew were rescued. The men were partly exhausted and one British

press report says they were unconscious. Three other members of the crew who were in the conning tower were not recovered until 4.35 a. m. the next day; *all three were dead when the conning tower was opened.*

3. The loss of Japanese submarine *No. 6:* On April 15, 1910, the Japanese submarine *No. 6* was sunk in 10 fathoms, with entire loss of officers and crew. The vessel was raised on the 16th and opened on the 17th. The cause of the disaster still remains unexplained. A translation of the diary of the commanding officer is contained in the following extract from the Scientific American, July 6, 1912:

"On April 16 last, submarine *No. 6*, of the Imperial Japanese Navy, was lost while maneuvering in Hiroshima Bay and all on board perished. She was commanded by Lieut. Takuma Factomu, and after the vessel was raised a letter of farewell from him was found in her conning tower. This remarkable document will be read with interest. The translation from the original published in the Japanese press appeared in the Kobe Herald, and is as follows:

"'Although there is indeed no excuse to make for the sinking of His Imperial Majesty's boat, and for the doing away of subordinates through my heedlessness, all on board the boat have discharged their duties well and in everything acted calmly until death. Although we are departing in pursuance of our duty to the State, the only regret we have is due to anxiety lest the men of the world misunderstand the matter, and that thereby a blow may be given to the future development of the submarines.

"'Gentlemen, we hope you will be increasingly diligent without misunderstanding the cause of the accident, and that you will devote your full strength to investigate everything, and so secure the future development of submarines. If this be done we shall have nothing to regret.

"'While going through gasoline submarine exercise we submerged too far, and when we attempted to shut the sluice valve, the chain in the meantime gave way.

"'Then we tried to close the sluice valve by hand, but it was then too late, the rear part being full of water, and the boat sank at an angle of about 25°. The boat rested at an incline of about 12°, pointing toward the stern. The switchboard being under water, the electric lights gave out. Offensive gas developed and respiration became difficult. About 10 a. m. on the 15th the boat sank, and under this offensive gas we endeavored to expel the water by hand pumps.

"'At the same time the vessel was being submerged we expelled the water from the main tank. The light having gone out, the gage can not be seen, but we know the water has been expelled from the main tank.

"'We can not use the electric current entirely; the electric liquid is overflowing, but no salt water has entered, and chlorin gas has not developed. We only rely upon the hand pump now. The above has been written under the light of the conning tower, when it was about 11.45 o'clock. We are now soaked by the water which has made its way in. Our clothes are pretty wet and we feel cold. I had always been used to warn my shipmates that their behavior (on an emergency) should be calm and delicate, while brave; otherwise we could not hope for development and progress, and that at the same time one should not cultivate excessive delicacy, lest work should be retarded. People may be tempted to ridicule this after this failure, but I am perfectly confident that my previous words have not been mistaken. The depth gage of the conning tower indicates 52 feet, and despite the endeavor to expel the water, the pump stopped, and did not work after 12 o'clock. The depth in this neighborhood being 10 fathoms, the reading may be correct.

"'The officers and men of submarines must be appointed from the most distinguished among the distinguished, or there will be annoyance in cases like this. Happily all the members of this crew have discharged their duties well, and I am satisfied. I have always expected death whenever I left my home, and therefore my will is already in the drawer at Karasaki. (This remark applies only to my private affairs, and it is not necessary. Messrs. Taguchi and Asami please inform my father of this.)

"'I respectfully request that none of the families left by my subordinates shall suffer. The only thing I am anxious about is this. (Atmospheric pressure is increasing, and I feel as if my tympanum were breaking.)

"'Twelve thirty o'clock, respiration is extraordinarily difficult. I mean I am breathing gasoline. I am intoxicated with gasoline.

"'It is 12.40 o'clock.'"

4. The loss of English submarine *A-7:* On January 16, 1914, while engaged with other submarines from Devonport, it was noted that the *A-7* was submerged for an unusually long time. It was concluded that the boat had met with an accident. Efforts to locate her were at first unsuccessful. There were 11 officers and men on board. On January 21 the submarine was found in 138 feet of water. Efforts to raise her were continued until March 6, when they were abandoned by order of the Admiralty.

5. The loss of the U. S. S. *F-4:* On the forenoon of March 25, 1915, the submarine U. S. S. *F-4* failed to return to the surface from a submerged run, and remained sunk outside the harbor of Honolulu until raised to the surface August 29, 1915, a period of more than five months. Her crew consisted of 2 officers and 19 enlisted men. First located at a depth of 305 feet, she was

gradually worked into a depth of 40 feet by May 25. Heavy swells wrecked the apparatus at the time employed, and salvage work was delayed until late in August, when new methods were employed with success. The deepest diving in history was undertaken in connection with the salvage of this ship. The manner in which the crew died will perhaps always remain uncertain.

The foregoing submarine accidents, will, I believe, tend to show that the hygiene of a submarine is largely a question of air supply. Consideration of food, its preservation or preparation, always comes back to consideration of air supply. Consideration of clothing, of rest, of sleep, must all bring us back to consideration of ventilation.

THE DEVELOPMENT OF THE CHEMICAL THEORY OF VENTILATION.

The problem of air for the submarine has no parallel in any other human habitation, and it is the problem of the submarine as a habitation which mainly concerns us. It is not a problem of chemistry alone, but it is also a problem of physiology. Nor are these two sciences alone concerned, but its very artificial character makes it also a problem of physics and of bacteriology. The development of modern ideas on the subject of air and respiration has been a slow and tedious process which has extended over many centuries and the discoveries of one science have often been delayed by awaiting new discoveries in other sciences.

Before Galen (131–201 A. D.) the arteries, because they were found empty after death, were believed by the ancients to contain air. But though Galen disproved this he taught that the object of respiration was to cool the fiery heart, the purpose of the chest's movements being to introduce air for generating vital spirits by the pulmonary vein and to get rid of the heart's smoky vapors by the same channel. It was wholly a physical theory; there was no science of chemistry to assist in any other conception.

For some 14 centuries this view remained all-sufficient, until William Harvey (1578–1657) taught and demonstrated the circulation of the blood. But Harvey had no conception of how or why we breathe, except that long associated with medieval mysticism. Robert Boyle (1627–1691) perhaps pointed out the way for our modern conception by his experiments with animals and combustion *in vacuo*, demonstrating that air was necessary to suport life as well as combustion. In his Memoirs for a General History of the Air we find this rather interesting estimate of the atmosphere:

"Our atmosphere, in my opinion, consists not wholly of purer æther, or subtile matter which is diffused through the universe, but in great number of numberless exhalations of the terraqueous globe; and the various materials that go to compose it, with perhaps some

substantial emanations from the celestial bodies, make up together, not a bare indetermined feculency, but a confused aggregate of different effluvia."

About 1669 Lower was able to demonstrate that the bright red color of arterial blood was due to the fact that it absorbed air while passing through the lungs. This was the important clew of the connection between the physiology and the chemistry of ventilation. All this time chemistry, that yet undeveloped science, had been waiting for this clew to point out the way for new discoveries, and with reasonable rapidity the mind of man found the way.

In 1674, some five years later, John Mayow (1643–1679) produced the treatise upon which his fame rests; it is entitled, "Tractatus quinque medico physici quorum primus agit de salnitro et spiritu nitro-aëreo, secundus, de respiratione, tertius, de respiratione foetus in utero et ovo, quartus, de motu musculari et spiritibus animalibus, ultimus, de rhachitide; studio Joh. Mayow, LL. D. & Medici nec non Coll. Omn. Anim. in Univ. Oxon. Socii. Oxonii e theatro Sheldoniano, An. Dom. MDCLXXIV." By a series of convincing experiments he was able to show that the dark venous blood was changed to bright red by taking up a certain ingredient in the air which, as being a constituent of saltpeter he termed the "spiritus nitro aëreus." It was he that more fully grasped the object of respiration and the fact that there was a definite constituent of the air which supported life, not necessarily "celestial in nature" and "identical with the essence of the stars." His early death, which took place in 1679 (he being then only 36 years of age), greatly retarded the development of the new chemistry. He not only sensed the exchange of gases between the blood in the air and the lungs, the one giving up its "spiritus nitro aëreus" and the other the "noxious vapors" of the body, but he located the seat of animal heat in the muscles, thus taking from the "fiery heart" another of its medieval conceptions, a view that remained undeveloped until von Helmholtz demonstrated it anew in 1845.

The latter part of the eighteenth century, after physiology had paved the way, and in the space of some 18 years, startling developments were made in the science of chemistry which laid the foundation of our modern conceptions of the theory of respiration. Between the period of 1757 and 1775, Black discovered carbon dioxid (1757); Cavendish discovered hydrogen (1766), Rutherford discovered nitrogen (1772), Priestley and Scheele discovered oxygen (1771), and Lavoisier, with untiring perseverance, from 1772 to the time of his premature death (he being executed in Paris during the Reign of Terror, May 8, 1794), exerted himself to overthrow the phlogiston theory and lay the foundations of our modern conceptions of chem-

istry. It was he who showed that oxygen was used up by the lungs in the formation of carbonic acid and water, and how this process, which was classified as one of combustion, furnishes to man the resulting animal heat. He taught that the expired carbon dioxid derived its carbon from the blood, and that to a certain extent we burn ourselves and replace what we have burned by consuming food. But the Lavoisierian theory of combustion was strongly combated, and as late as 1796 we find Lamarck attacking the theory which he referred to as the "pretended existence of a material called oxygen which the pneumatic chemists have never seen nor studied, and the existence of which they imagine to explain the effects of 'fixed acidific air.'"

For the past 140 years this conception of air and of respiration has been more elaborately developed, and with this development have grown other ideas. These ideas have to do with the vitiation of air by different factors, which render it unhealthful or unfit to breathe. The vitiation of air by human beings has been extensively studied, and these studies fall most naturally under five heads, as follows:

(*a*) The rôle played by a deficient oxygen pressure.

(*b*) The rôle played by an increased carbon-dioxid pressure.

(*c*) The rôle played by the skin.

(*d*) The rôle played by a possible toxic organic substance in expired air.

(*e*) The rôle of bacteria and dust.

THE DEVELOPMENT OF THE PHYSICAL THEORY OF VENTILATION.

Throughout the nineteenth century an abundance of laboratory experiments were undertaken, each contributing its share to a better understanding of the chemical and physiological conception of the theory involved, but skeptics cropped up now and again who were not entirely satisfied with the application of these laboratory experiments and investigations to the actual conditions, and at the present time we are seeing an increasing skepticism on the matter of the chemical importance of air vitiation. The new school does not entirely eliminate the importance of the rôle played by diminished oxygen pressure, increased carbon dioxid pressure, or possible presence of an organic poison, but they hold that the conditions under which these factors are of importance are exceedingly unusual. The new school is bringing the physics of the problem strongly to the fore.

In 1883 Hermans, of the Hygienic Institute in Amsterdam, having convinced himself of the inadequacy of the oxygen and carbon-dioxid theory and finding by his own experiments no evidence of the existence of an organic poison, and observing that his own bodily

temperature in crowded theaters and churches rose from 0.3 to 0.6 C., put forward the theory that the evil effects of air that had been vitiated by human beings are due simply to the inability of the body to cool itself because of the surrounding elevated temperature and increased humidity. Heat and humidity and their bearing on certain pathological manifestations, notably insolation, have long been recognized, but the connection of the minor symptoms of air vitiation in crowded theaters and churches had not been traced. Hermans did not support his opinion with experimental evidence.

The chief contributors to the experimental proof of this view have been Lewaschew, Haldane, Flügge, Heymann, Paul, Ercklentz, Hill, and the New York State Commission on Ventilation (Winslow, Kimball, Lee, Miller, Phelps, Thorndike, and Palmer). Quoting from an article by Prof. Frederic S. Lee, the explanation of this view is briefly as follows:

"Living beings constantly produce and give off to their environment an excess of bodily heat. This heat must be constantly carried away from the body and is carried away partly through the lungs in expired air, but chiefly through the skin by the process of radiation, conduction through the clothing, and the evaporation of perspiration. It is obvious that to insure this necessary and healthful removal of heat there is needed an atmosphere about the body that is neither too hot nor too humid. If it is too hot, radiation and conduction are prevented; if too humid, the evaporation of perspiration is interfered with; and if the two conditions exist simultaneously the result is a rise of bodily temperature with concomitant interference with the body's well-being. According to this conception the air problem involved is one of physics and not of chemistry; the physiologic problem is a problem that begins with the skin and not the lungs; and the ventilation problem is a problem of maintaining the proper temperature, humidity, and motion of the air."

FATALITIES ATTRIBUTED TO AIR VITIATION.

Should we review the incidents in connection with the most frequently quoted fatal example of air vitiation to human beings—the Black Hole of Calcutta—we might be able to account for it to some extent on the basis of this physical theory, though in fact it has served to illustrate all theories with regard to the cause of air vitiation. Increased carbon dioxid has usually been assigned the rôle of the factor of vitiation and the circumstances were as follows: Suraj-ud-Dowlah, a youth of 19 years, ruler of Bengal, in pursuit of one of his own family who had escaped from his vengeance, marched against the British at Calcutta. Many of the British fled, but those who remained surrendered after a feeble resistance, were made prisoners,

and confined in the military jail of Fort William. This military jail, known as the "Black Hole," consisted of a room 18 feet by 14 feet 10 inches in size, with only two small windows, barred with iron. It was the month of June, in the year 1756, a month in which the tropical heat of Calcutta is notoriously most oppressive. The mean summer temperature is 86.7 F. and the mean annual rainfall 70 inches—a hot and humid climate. When the door of the prison was opened in the morning only 23 of the 146 prisoners were found alive. Considering that the adult human being will give off approximately 10 ounces of watery vapor by the lungs and 20 ounces of watery vapor by the skin, considering the high heat of the season, we may well imagine factors of heat and humidity which might well be taken into consideration in explaining this incident.

But the Black Hole of Calcutta and the episode of the steamship *Londonderry* have also been used to illustrate the possible presence of a highly poisonous organic substance in expired air. The *Londonderry* encountered a severe storm, and with hatches battened down 200 steerage passengers were forced to occupy a cabin space 18 by 11 by 7 feet in height, with the result that 80 persons were found dead the next morning.

THE CHEMISTRY OF THE ATMOSPHERE.

The average composition of air may be said to be, in 100 volumes:

	When inspired.	When expired.
Oxygen	20.60 vols.	16 vols.
Nitrogen	76.90 vols.	77 vols.
Argon	1.00 vol.	1 vol.
Carbon dioxid	0.04 vol.	4 vols.
Aqueous vapor (about)	1.46 vols.	2 vols.
Ammonia	Traces.	
Ozone	Traces.	
Nitric acid	Traces.	
Marsh gas	Traces.	
Sulphurous anhydrid	Traces.	
Sulphuretted hydrogen (in towns)	Traces.	

In the proportion of argon given above is included its congeners, helium, neon, krypton, and xenon.

After the work done by Black, Cavendish, Rutherford, Priestley, Scheele, and Lavoisier, between 1757 and 1775, a calm of scientific certainty pervaded the chemical world on the subject of chemical constituents of the atmosphere. In 1785 Cavendish asked himself the question: Is the so-called nitrogen separated from the atmosphere wholly nitrogen, or is there a part which can not be reduced to nitrous acid? He concluded that not more than 8 parts per 1,000 could be regarded as differing from true nitrogen. In 1894 Lord Rayleigh and Sir William Ramsay discovered, and later announced

the discovery of, a new gas in the atmosphere which they called argon, and in approximately the proportions indicated by Cavendish. This discovery prepared the way for the discovery of other gases which with argon are sometimes called the "noble gases," the other gases being known as neon, krypton, and xenon. Helium, which had been known as an element in the sun since 1868, was again encountered here. Argon and its companions, so far as known, have no valency, and therefore form no chemical compounds.

Chemistry is indeed a wonderful science, and remarkable advances have recently been made in connection with radio-active substances and their radiations. The atomic theory of Dalton, based largely on the study of gases and developed by Gay-Lussac, Dulong and Petit, Avogadro, and Mendeléeff, has been further elaborated by the discovery of radium. Our chemistries formerly described an atom in this way:

"An atom is the smallest portion of matter that can exist; it is incompressible, indivisible, and itself unchangeable."

And yet, since 1904, when Sir J. J. Thomson discovered the electron and evolved therefrom the corpuscular theory of matter, one by one each of the properties ascribed the atom in our definition has been demonstrated to be erroneous.

The view is gaining ground that atoms are not the smallest portions of matter than can exist; that they are compressible, elastic, deformable entities, capable of yielding to every source of pressure which may be applied to them; that they are divisible, consisting of an electro-positive nucleus and electro-negative electrons, and finally they can not be regarded as unchangeable, as the radio-active atoms are constantly disintegrating.

This change in theory, due to recent discoveries, has so slaughtered the older definition of an atom that we may well speculate on what new discoveries the future may have in store for us. At the same time we should realize that no actual progress is made in chemistry except that which may be demonstrated as facts.

THE PHYSICS OF THE ATMOSPHERE.

Physiologists are beginning to take more notice of certain physical facts in relation to the atmosphere as they affect human beings. These physical facts include the weight, pressure, or tenuity of the atmosphere, the temperature, the humidity, and the movement of air, which hastens diffusion, and other physical phenomena.

DIMINISHED OXYGEN PRESSURE AND THE EFFECTS OF ATMOSPHERIC TENUITY IN AVIATION, BALLOONING, AND MOUNTAIN CLIMBING.

The composition of outdoor air is relatively constant. An investigation lasting over three years in which daily analyses of the air were

made by Miss Alice Johnson for the Carnegie Institute of Washington, Boston, Mass., proved that the percentage of carbon dioxid and oxygen in uncontaminated outdoor air remained practically constant throughout the entire year, irrespective of wind direction and temperature. Specimens of normal air secured at numerous places on the Atlantic Ocean and on the top of Pike's Peak showed the same remarkable uniformity.

The air of the submarine is the direct descendant of the atmosphere, the chemical constituents of which have been given, but from the moment the hatches are closed the relationship becomes more and more remote, until vitiation has progressed to the stage where the air can no longer support life. Human beings not only pollute it, but gases are also evolved from the accumulators. It must be noted here that one of the main reasons why the air of the submarine must be regarded as a special problem is the fact that the atmospheric air begins to deteriorate from the moment the hatches are closed, and that prolonged submersion can only be made possible by providing some method of air purification and air renewal. The oxygen of the atmosphere which may be normally present in amount equal to 20.6 volumes per 100 will drop hour by hour as this gas is extracted by the process of respiration. Pettenkofer and Voit found that the mean consumption of oxygen during 24 hours by a man weighing 70 kilos is about 700 grams, or 490 liters (0.72 cubic feet per hour). By actual experiment it has been determined that the average consumption of oxygen per man under inactive conditions within the submarine is about 0.9 cubic feet per man per hour (Brown and McEntee). Belli and Trocello in their investigations with Italian submarines placed it at 25 liters (0.888 cubic feet) per man per hour. The latter observers found the oxygen dropped at the end of a two-hour submersion from 21 to 19.6 per cent, the initial air volume being 150 cubic meters with 12 men on board. The former observers found the oxygen dropped after a submersion of 16 hours 50 minutes to 14.63 per cent, the initial air being 3,483 cubic feet with 14 men on board. Both of these tests were made in submarines containing batteries with the acid electrolyte. Brown and McEntee found a slight addition of oxygen in the contained air generated by the batteries; this amounted to approximately 0.2 of a cubic foot per hour, the ratio between the amount of oxygen and hydrogen given off being 1 of oxygen to 45 of hydrogen. In an experiment recently conducted in a submarine equipped with the alkaline batteries results of air examinations indicated that these conditions were reversed and that oxygen was given off in greater volume than the hydrogen. The examination of the air at the end of a nine-hour submersion showed as follows:

Hour.	Oxygen.	Hydrogen.
9.12	21.36	.09
6.12	20.24	1.56

It is interesting to fix a limit to which the oxygen pressure may safely fall. McEntee and Brown in their report fixed on an arbitrary figure as a result of their work, that oxygen should not fall below 15 per cent under submerged conditions. Regnault and Reiset in 1849 proved experimentally that oxygen can be diminished to 10 per cent in inspired air before respiration becomes quickened. Müller in 1858, Paul Bert in 1870, Friedländer and Herter in 1879, and others have obtained similar experimental results. Considering that the oxygen breathed at the sea level would amount to 20.60 per cent of one atmosphere, the oxygen partial pressure would equal 156.56 mm., the total atmospheric pressure being equal to 760 mm. of mercury. At the proportion of 15 per cent the oxygen partial pressure would equal 114 mm.

Aviators have ventured to great heights, the greatest height attained to date being 26,246 feet, nearly the height of Mount Everest (29,000 feet). At this altitude the aviator is in an air pressure of approximately 6 pounds per square inch, or 302 mm. of mercury. The oxygen partial pressure at this height, assuming the same conditions of diffusion, would be equal to a partial pressure of 62.2 mm. of mercury, a very considerable reduction of total oxygen supply at ordinary rate and depth of respiration.

Still greater altitudes have been attained by balloons. Over 100 years ago Gay-Lussac (Sept. 16, 1804) ascended 23,000 feet and brought down samples of air for comparison by chemical example with the air of the earth's surface.

In 1862 the British Association for the Advancement of Science arranged for a number of ascensions for scientific purposes. They employed the services of Mr. Coxwell as pilot and Mr. Glaisher of the Greenwich Observatory as an observer. Several ascensions were made during which Glaisher observed increased respiratory and pulse rates. Starting with a pulse rate of 76 per minute at the surface he noted an increase to 90 at 10,000 feet, 100 at 20,000, 110 at higher elevations. The most memorable ascent made by these aeronauts was made at Wolverhampton September 6, 1862. Glaisher became unconscious at 29,000 feet, and Coxwell, unable to use his hands, pulled the valve line with his teeth. Glaisher estimated that on this occasion they continued to ascend to 37,000 feet, as the balloon at the time was rising at a rate of 1,000 feet per minute.

On April 15, 1875, H. T. Sivel, J. E. Crocé-Spinelli, and Gaston Tissandier, ascended from Paris in the balloon *Zenith* to an altitude of 27,950 feet. Only Tissandier came down alive, his two companions losing their lives, according to accounts as a result of asphyxiation. The highest well-ascertained ascension was made during a series of balloon flights by Dr. Berson. The record flight was made July 31,

1901, at Berlin. Berson and Süring actually noted a barometric reading corresponding to a height of 34,500 feet, and possibly rose 1,000 or 1,500 feet higher, though in spite of oxygen inhalations they were unconscious during the highest portion of the ascent.

But the effects of the tenuity of the atmosphere have long been recognized in connection with mountain climbing, and have been accurately described by Mr. Whymper in connection with the ascent of Chimborazo. Symptoms were first noted in the altitude of 16,664 feet, and are described as severe headache, dyspnea, intense thirst, light fever, and general malaise. Persons ascending the railroad at Pike's Peak and the cableway from Chilecito to the Farnatina copper mines in the Andes are frequently affected; the latter railroad ascends 10,000 feet in the space of some 12 miles. At the starting point the summer sun shines hotly, while at the terminus the average summer temperature seldom rises above 5 C.

Before taking up the consideration of oxygen pressures within the lungs and the tissues of the body, it seems proper to consider the temerity of man in venturing to oxygen partial pressures of a greater degree than that of air at the sea level. This is best considered in connection with its practical application to deep diving. It may be noted that the barometric pressure of 760 mm. of mercury at the sea level is equivalent to a column of fresh water 34 feet in height, or a column of salt water 33 feet in height. It is therefore evident that for each 33 feet one descends in salt water an additional pressure equal to the weight of one atmosphere is assumed. Before 1907 a dive to the depth of 100 feet was considered a very deep dive. In that year the work of the British Commission resulted in new conceptions of the physical principles involved, and dives were safely made to a depth of 210 feet. The work was then undertaken in the United States Navy under Passed Asst. Surg. French and Chief Gunner Stillson, during which an apparatus was developed so that dives were safely made in connection with the salvage of the submarine *F-4* to a depth of 306 feet, corresponding to a pressure of 7,047.25 mm. of mercury, or an oxygen partial pressure of 1,452 mm.

THE RESPIRATORY EXCHANGE OF OXYGEN IN THE LUNGS AND TISSUES.

Physiologists in assuming a mechanical interpretation of the transfer of gases in the lungs and in the tissues always assume a pressure equivalent to that at the sea level—that is to say, a pressure of 760 mm. of mercury.

As stated above, inspired air contains approximately 20.6 volumes of oxygen, while expired air contains only 16 volumes, the ventilation of the alveoli of the lungs being accomplished by the physical laws governing the diffusion of gases. The oxygen content of the alveoli

is probably constantly below the content of expired air for the reason that tidal air in the respiratory tree is never completely mixed with the air remaining in the alveolar spaces. The partial pressure of oxygen in air under standard conditions is 156.56 mm. of mercury or 20.6 per cent of 760 mm. of mercury. The partial pressure of expired air under standard conditions with 16 per cent oxygen is but 121.6 mm. of mercury. The figures show a diffusion pressure equal to the difference between 156.56 and 121.6, or a diffusion pressure of 34.96 mm. to carry the oxygen of tidal air into the alveolar spaces of the lungs, and this pressure is further increased by the fact that the absorption of oxygen in these spaces is constantly going on, so that the mean difference is greater.

A liquid, such as water, will when exposed to a gas take up the gas by absorption according to definite physical laws. An analysis of the blood shows that it contains oxygen, carbon dioxid, and nitrogen; the gases of the air. The gases for purposes of estimation are extracted by some special type of gas pump as those of Ludwig or Sprengel. The average gaseous composition of the blood in a volume of 100 c. c. may be stated as follows:

	Oxygen.	Carbon dioxid.	Nitrogen.
	c. c.	c. c.	c. c.
100 c. c. arterial blood	22.6	34	1.7
100 c. c. venous blood	12.0	45	1.7

The amount of oxygen absorbed in blood plasma is comparatively small. The oxygen tension, or absorption pressure, has been found to be from 4 (Strassburg) to 10 (Herter) per cent. Accepting the above limits for a working average, the oxygen tension in arterial blood would be from 30.4 to 76 mm. of mercury. Blood plasma exposed to air with a partial oxygen pressure of 30.4 to 76 mm. of mercury would absorb only from 1.0 to 0.3 of a cubic centimeter of oxygen for each 100 c. c. of blood. But we have seen above that 100 c. c. of arterial blood contain 22.6 c. c. of oxygen; it is therefore evident that there is some other special oxygen-absorbing ingredient which must take this gas up in chemical combination. The property of taking up this large quantity of oxygen is ascribed to hemoglobin, the respiratory pigment in the erythrocytes. Hemoglobin is the most complex molecule in the body. It is the iron-carrying constituent and its molecular weight is enormous (16,669); the oxygen probably links with the iron atom. The hemoglobin (oxyhemoglobin) of the arterial blood carries a definite amount of oxygen in chemical combination. While so carrying this oxygen its color is a bright red and its spectrum is characteristic, containing the two absorption bands, one in the

yellow, the other in the green, of the solar spectrum. When subjected to the mercurial air pump the oxygen is given off and the pigment becomes of a purple color. One hundred cubic centimeters of blood contain about 14 grams of hemoglobin, and 1 gram of hemoglobin liberates 1.34 c. c. of oxygen (Hüfner). The reduced hemoglobin has a characteristic spectrum. Instead of the two absorption bands, only one now appears, which is fainter in character and largely occupies the space between the two absorption bands of oxyhemoglobin. As rapidly as oxygen comes in contact with living protoplasm in the capillary circulation it enters into a fixed chemical combination. Hemoglobin has a greater affinity for oxygen than it has for carbon dioxid and therefore gives up the one in the lungs to take up the other, but living protoplasm has a greater affinity for oxygen than hemoglobin, which it takes up in the process of cellular respiration or combustion. As the oxygen enters into a fixed chemical combination in the tissue cell, the oxygen tension drops to zero. Under these circumstances the difference in pressure between the oxygen tension in the blood and that in the tissues is sufficient to cause a rapid diffusion of oxygen through the capillary walls with corresponding liberation of oxygen from the hemoglobin.

Considering the pressure relations of oxygen from its introduction into the body with fresh air until its fixation in the tissues, we may construct the following schema:

	Mm.
Oxygen partial pressure in atmosphere	156.60
	↓
Oxygen partial pressure in alveolar air	121.60
	↓
Oxygen partial tension in arterial blood	29.64
Oxygen partial pressure in venous blood	22.04
	↓
Oxygen tension in tissues	0.00

It is probably true that we can not account for the exchange of gases in the tissues and in the lungs wholly by the mechanical theory, and much work remains yet to be done to put it on a more substantial basis, but like all theories it serves as a stimulus to acquire more facts to substantiate it or to tear it down.

THE THEORY OF SECRETION OF OXYGEN BY THE LUNGS.

It has been suggested that the living epithelium of the lungs and the living epithelium of the capillaries exert a distinct influence on the passage of oxygen from the air to the blood and from the blood to the tissues in such manner that this phenomenon might be regarded as a secretion of this gas.

Bohr was strongly impressed with the belief that the passage of oxygen into the lungs was not a mere process of diffusion but also involved a distinct secretory activity by the pulmonary epithelium.

He found some support for his theory in the fact that in the air-bladders of certain fishes a distinct secretion of oxygen can be proven. Prof. Henderson has recently lent support to this theory in connection with observations on Pike's Peak. The altitude of this peak is 14,107 feet, and the barometric pressure is approximately 450 mm. of mercury. He noted that the symptoms of mountain sickness continued for a period of about four or five days and at the end of this time the symptoms would disappear and the individual fully recover therefrom, and attributes this to the adjustment on the part of the lungs to the atmospheric condition and the power of the living epithelium of the lungs to secrete more actively oxygen from the air of the lungs into the blood.

THE EFFECTS OF INCREASED ATMOSPHERIC PRESSURE.

Much remains to be properly explained with regard to oxygen absorption as well as with regard to the effects of bad ventilation and the stimulating influence of fresh air. We are coming to understand from our studies in connection with caisson sickness and deep diving that the nitrogen of the air can not be disregarded in any studies in connection with respiration. We are learning that this is normally absorbed in the blood and tissues and that such absorption varies with the partial pressure and is roughly 1 per cent of nitrogen per atmosphere (Hill and Macleod). It has been quite conclusively demonstrated that caisson sickness and diver's palsy are due to an increased amount of this gas in the tissues, consequent upon an increase in its partial pressure, and the symptoms are due to the fact that rapid reduction of pressure, before elimination can take place, results in the expansion of this gas into bubbles with the production of the so-called "gas emboli." We can not forget that we are at the bottom of an aerial ocean and saturated with its gases. This pressure under standard conditions is sufficient to force the atmospheric gases into metals, which phenomenon is known as the occlusion of gases. These occluded gases are given off in a high vacuum and have long been a factor in connection with the operation of the X-ray tubes, the occluded gas in the metal being largely, but not entirely, driven off by heat and electric discharge during the process of pumping the tube. Nor should we forget the power of solids under certain conditions to transmit gases. Carbonic oxid may, for instance, traverse red-hot cast iron. The utilization of platinum by Villard as an osmo-regulator of X-ray tubes is well known, the platinum when heated to red heat being capable of being permeated by hydrogen gas. The enormous power of absorption possessed by coconut charcoal suggests that there may be a power of occlusion in living protoplasm worthy of extended experimental study. When

any mixture of gases is presented to a liquid, each gas is absorbed in proportion to its own specific solubility in that liquid and in proportion to the partial pressure exerted by it.

A study of aviation accidents such as the incident described by Ovington, the accident to Chavez, and a host of others where the deaths are summed up in the list of casualties as "lost control," as well as the growing importance of aviation and of deep diving, all will, I trust, add a new stimulus to the study of this important subject. The personnel of the Navy are venturing into wide ranges of oxygen partial pressure varying from 93 mm. to 1,427 mm. of mercury. Submersion in either one of these pressures above or below the normal oxygen partial pressure of 156.56 mm. of mercury for any but a very temporary period would probably produce untoward symptoms, and it is therefore necessary to consider the subject of saturation of gases or desaturation of gases at increased or decreased partial pressures. This may best be understood by considering the gas-embolus theory of caisson sickness.

It is a well-established fact that "caisson disease" and "diver's disease" never occur when the patient is under pressure, *but only after the individual has reached the surface and the pressure is thus reduced.*

Should one enter a compression chamber and the air contained therein be brought to a pressure of 20 gage, or 20 plus, as it is sometimes called, the body would begin rapidly to absorb air at this pressure and after a long period saturation would be complete. Now, if the pressure were suddenly released to 0 gage, the pressure of the gas absorbed by the tissues would be 20 gage while the surrounding atmosphere would be 0 gage, and the gas in the tissues would expand and form gas bubbles there. It is due to these bubbles of nitrogen gas in the tissues that we have the phenomenon of caisson disease when the diver or the sand hog reaches the surface.

THE GAS-EMBOLUS THEORY.

The work by Haldane, Boycott, and Damant, who undertook the deep-diving investigation for the British Admiralty, and the work of Leonard Hill, Macleod, and others, has placed the whole subject of saturation and desaturation, or decompression, on a practical basis. For the purpose of getting a clear idea of the subject we must consider the only gas concerned to be nitrogen. The blood in the capillaries of the lungs must dissolve nitrogen from the air in direct proportion to the pressure of this gas in the alveoli. The dissolved gas is carried by the blood to the tissues and these in turn absorb it until the pressure is again equalized between them and the blood. The blood, after giving up its excess of dissolved nitrogen,

returns to the lungs, there to receive a fresh charge, and this goes on until the blood and the tissues are saturated with gas at the same pressure as the surrounding atmosphere.

The above changes must be within certain limitations of time, and these limitations are controlled in a measure by certain considerations. The blood of man constitutes one-twentieth of the body weight, so that if tissues were all liquid they would dissolve twenty times as much nitrogen as the blood. In man, however, the tissues are two-thirds water, and they contain from 15 to 20 per cent fat. Now, fat will dissolve five times more nitrogen than water (Vernon), consequently it takes longer for a given quantity of tissue than of blood to become saturated at a given pressure. On account of the fat they contain, the tissues in the average man will absorb 35 times more gas than his blood. We will now assume that it will take one minute for all the blood of the body to complete a cycle of more or less equal distribution, and on this assumption if the body were suddenly immersed in an increased pressure, at the end of the first minute the tissues would be one thirty-fifth saturated. In the next minute there will be saturated one thirty-fifth of the remaining thirty-four thirty-fifths, and so on. After 5 minutes the body will be about 22 per cent saturated; after 30 minutes 50 per cent saturated. It would take two hours before saturation would be complete. Such a calculation is, however, subject to a further adjustment, as it is based on the assumption that the blood is distributed evenly throughout the body; but such is not the case, for the mass movement of the blood varies in a considerable degree, the volume being much greater in active muscles and glands than in passive structures, such as fat and joints. The less vascular tissues will lag behind the others and thus prolong the time necessary for the saturation of the body as a whole. "We see, therefore, that after some time in compressed air the blood and active tissues will be saturated and contain volumes of dissolved gas in proportion to their relative bulks; the fat, although not saturated, will yet contain up to five times more gas than an equal volume of blood, and the passive tissues will be incompletely saturated" (Macleod).

Based upon the above considerations of the gas-embolus theory are the practical studies of decompression, the all-important measure for the prevention of casson sickness.

The worker in compressed air may, therefore, be likened to a bottle of aerated water, the gas being in solution as long as the pressure is maintained, or the cork in place; remove the pressure by extracting the cork and the excess of absorbed gas rapidly forms bubbles and seeks to escape.

The presence of gas emboli in the spinal cord has long been known (Leyden, F. Schultze, Hoppe-Seyler, and Paul Bert). The work of

the British Commission and of Leonard Hill contains ample support of their theory in their experiments on animals. Erdman, in connection with this disease in the workers of the East River tunnels, reports the finding at necropsy of a collection of 5 c. c. of gas beneath the mucosa of the jejunum. In two other cases he reports aspirating 1 c. c. of gas from beneath the periosteum of the tibia, and finally he reports a necropsy wherein, with the assistance of Dr. J. E. McWorker, he collected, 14 hours postmortem, 3.1 cubic centimeters of gas from the right heart of a man who died one hour after a 17-minute decompression following 8 hours exposure to plus 30 gage. Upon analysis this gas yielded: Nitrogen, 80 per cent; CO_2, 20 per cent; which percentages are in accord with analyses made in animal experiments by various observers.

It is undoubtedly true that a reverse process from standard conditions must be taken into consideration with other factors in connection with aviation or of any condition which leads to a decrease in the atmospheric or the oxygen partial pressure. One of the other factors is undoubtedly that of the diffusion oxygen partial pressures in the alveoli of the lungs, which, as shown before, amounts to approximately the difference between 121.6 and 29.64 mm. of mercury, and the diffusion pressure of capillary venous blood, which is shown above to be the difference between 22.04 mm. of mercury and 0.00 pressure in the tissues, where the oxygen is absorbed by the protoplasm.

THE RÔLE PLAYED BY CARBON DIOXID.

Carbon dioxid is a normal excretion from the lungs. It will not support life nor combustion. We were formerly taught that in a pure form it is fatal when present to the extent of 75 parts per 1,000; that 15 parts per 1,000 give rise to giddiness, faintness, headache, and shortness of breath, while anything below 10 parts per 1,000 appears to produce no effect immediately on health (Notter and Firth). The gospel of good ventilation has long centered about the index of air pollution as represented by the amount of this gas present.

It is, therefore, somewhat of a shock to read the following as one of the conclusions in the paper recently appearing (February, 1915) in the American Journal of Public Health entitled "Some Results of the First Year's Work of the New York State Commission on Ventilation":

"6. Stagnant air at the same temperature as fresh air, even when it contains *20 or more* parts [the italics are mine] of carbon dioxid and all the organic and other substances in the breathed air of occupied rooms, has, so far, shown no effect on any of the physiological

responses listed above under 1 and 3 nor on the power or inclination to do physical or mental work nor on the sensations of comfort of the subjects breathing it."

This is a remarkable statement. They do not say whether these CO_2 estimations represent parts per 100, per 1,000, or per 10,000. I am persuaded that the statement refers to parts per 10,000, but a more loose and dangerous statement seems to me to be contained in the words 20 or *more*. "More" is a dangerous word. It is indefinitely greater than 20. In discussing the effects of a dangerous gas I can understand how an estimate of 20 or less might carry with it some definite information because it would set a limit, but 20 or more places no limit to the amount, and, it seems to me, detracts somewhat from value of their important work and breeds a degree of contempt for poor ventilation which can lead to no good result.

There have been some remarkable observations made recently in connection with *temporary* submersions in very high CO_2 pressures. Some of these were made on one or more men in the respiration chamber of some physiological laboratory; others not very generally known or quoted were made on groups of men in submerged submarines. The experiments of Hill, Rowland, and Walker are, perhaps, the most frequently quoted and were as follows. The tests were performed in an air-tight chamber of two-meters cubic contents and fitted with an electric stove, three electric fans in the roof, and glass windows.

First series: Eight men were shut up in the chamber. No ventilation was allowed. After 44 minutes the dry bulb stood at 87 F., the wet bulb 83 F. The CO_2 had risen to 5.25 per cent. The oxygen had fallen to 15.1 per cent. The discomfort felt was very great, all were wet with sweat, and the skin of all was flushed. The talking and laughing of the occupants had gradually become less and then ceased.

Immediate relief resulted from turning on the electric fans and whirling the air in the chamber—very great relief in spite of the temperature of the chamber continuing to rise. On turning off the fans the discomfort returned—the occupants cried out for the fans. It is of interest that no headaches or after effects have followed this type of experiment, which was repeated five times.

In another experiment two men were shut up in the chamber—a subject and an observer. The electric heater was used to raise the temperature to about 85 F. wet bulb. The subject inhaled through a soda-lime tin and exhaled through an air meter. In this way CO_2 was inhaled only in traces. The pulse frequency, pulmonary ventilation, and body temperatures were recorded. The turning on of the fans gave complete relief to the feelings of discomfort and lowered

the pulse frequency. Having proved this, the subject ceased breathing through the soda-lime tin. A bag containing CO_2—enough to raise the percentage in the chamber to about 2 per cent—was opened and the CO_2 allowed to escape into the chamber unknown to the subject. The sudden increase of CO_2 had no influence on the discomfort; it was not increased in spite of the increased depth of the respirations. The turning on of the fans relieved the discomfort as before and vice versa.

Belli and Trocello, of the Italian Navy, made some interesting observations in connection with the air of submarines, which were published in the Annali di Medicina Navale e Coloniale, January, 1908. The experiments were conducted on board a typical submarine of 150 cubic meters capacity with a complement of 12 men aboard. The carbon dioxid present amounted to 9.6 per cent after an immersion of two hours, with a maximum of 11 per cent and a minimum of 8.9 per cent. The amount of CO_2 produced by the men alone would have increased the amount in the air to only 5 per cent; the remainder, therefore, must have come from sources other than respiration (the accumulators).

These authors, who reported their experiments some three years before the experiments of Hill, Rowland, and Walker, so often referred to, and some three years after the experiments of Flügge, speculated upon what means might be considered to establish a danger signal of the air vitiation. The olfactory sense becoming quickly blunted, the physiological signal for those inclosed is abolished. If the ordinary standard limits of carbonic acid were accepted the danger limit would be reached at the end of 23 minutes submersion, calculating upon the amount of CO_2 produced by the men alone; but since it was found that the quantity of CO_2 came from other sources, even this brief time would become still shorter. In practice, however, things take a different aspect. While a sojourn in a submarine is not an agreeable one, it is possible, according to the personal experience of the authors, to live and work in such an atmosphere without appreciable suffering for two hours. The carbonic-acid test, therefore, can not be applied here. In the absence of either the olfactory test or the carbonic-acid test, the only practical guide recommended by Belli and Trocello for submarines consists in a few small mice kept in a cage; whenever these begin to die, they believe that danger also begins for the men. Mice are especially useful for this purpose, because they are extremely sensitive and much less resistant to the influence of the dangerous gases accumulating in submarines during submersion, and the method seems to have done good service and stood the test on board some of the English submarines.

The conclusions of Brown and McEntee from their work in connection with a study of submarines of the *E* class was as follows:

"7. Highest CO_2 and lowest oxygen percentages: The longest period of submersion was 16 hours 50 minutes. The initial air was 3,483 cubic feet; the number of men 14. CO_2 reached a maximum of 5.30 and oxygen fell to a minimum of 14.62.

"8. Effects of breathing the vitiated air: Breathing was first noticeably affected when CO_2 had increased to 3 per cent. Effects were then progressively noted. Breathing became labored and exhausting between 4 and 5. Distress was marked about 5 per cent.

"9. Permissible limits of CO_2 and oxygen: It is recommended that 2 per cent be the permissible limit of CO_2; that 15 per cent be the lowest limit for oxygen under submerged conditions."

Flügge and Hill and their co-workers, and the New York Commission on Ventilation, have been pursuing their studies, perhaps, without consideration of the extreme conditions which might pertain on board a submarine. The application of their work is probably directed to the ventilation of buildings housing many people, and where there is some ingress and egress of air and where the CO_2 under worst conditions seldom exceeds 50 parts per 10,000, or one-half of 1 per cent. This amount is well inside—in fact it is only one-fourth—of the permissible limit recommended by Brown and McEntee.

There has been a strong tendency of late to regard respiratory CO_2 and battery CO_2 as two different gases in their effect upon the physiological responses. It has long been noted that the excessive amount of CO_2 present in the air of bottling establishments and breweries apparently caused no injury to the health of the workmen. CO_2 is a by-product in various industries, as sugar refineries, starch factories, paper mills, lime kilns, print works, and in large beer vats and wine cellars where the gas is a product of fermentation. Some authors are now inclined to place the percentage of permissible CO_2 much higher than formerly, thus W. Gilman Thompson in his Occupational Diseases states:

"Five per cent of carbonic-acid gas in the air may be breathed without inconvenience, but 10 per cent causes constriction of the larynx and dyspnea, and 20 to 25 per cent gives rise to fatal asphyxia, for the gas itself is an intoxicant, besides replacing the oxygen of the air."

Thus in the space of a few years our instructors are lifting the fatal dose of CO_2 from 75 parts per 1,000 (Notter and Firth) to from 200 to 250 parts per 1,000 (W. Gilman Thompson).

The principles in connection with the absorption of carbon dioxid in the blood are the same as those already described in the case of

oxygen, except that CO_2 is three times more soluble than O. The amount of CO_2 separated from the lungs is nearly though not wholly in proportion to the amount of oxygen absorbed in the lungs. Some of the oxygen absorbed is used in the formation of urea, some in the formation of water, and some in other manners so that the volume of CO_2 exhaled is not equal to amount of oxygen absorbed. This loss of oxygen is known as the respiratory quotient thus:

$$\frac{CO_2 \text{ exhaled}}{O_2 \text{ absorbed}}.$$

Normally in man on a mixed diet the respiratory quotient is

$$\frac{4.0 \text{ to } 4.5}{5} = 0.8 \text{ to } 0.9.$$

The respiratory quotient is theoretically highest on a carbohydrate diet and lowest on a diet of fats.

Carbon dioxid is present in the blood in the proportion of 45 c.c. of the gas in 100 c.c. of venous blood. Of this quantity about 5 per cent is in simple solution in the plasma, 10 to 15 per cent is in firm combination in such forms as the carbonates, bicarbonates, etc., while the remaining volumes per cent is held in loose chemical combination.

The pressure relations of this gas as regards its diffusion in process of elimination are shown in the following scheme (Kirkes' Handbook of Physiology, eighth American revision):

Carbon dioxid tension in tissues	58	mm. of mercury
	↓	
Carbon dioxid tension in venous blood	45	mm. of mercury
	↓	
Carbon dioxid tension in alveolar air	23 to 38	mm. of mercury
	↓	
Carbon dioxid tension in expired air	5.8	mm. of mercury

The rôle of carbon dioxid as a regulator of the respiratory center has been recently strongly brought to the fore by Prof. Yandell Henderson, of Yale. His work has been reported in a series of papers recently published in the American Journal of Physiology. Carbon dioxid is introduced to us not in the rôle of a practically insignificant waste product but as an important regulator of several vital functions of the human body.

"Perhaps," writes Henderson, "there is no idea more firmly fixed in the medical mind, or which is harder to root out, than that the respiratory center is sensitive to alterations of oxygen supply. Yet, during the past few years it has been conclusively demonstrated that within wide limits the respiratory center is indifferent both to excess and to lack of oxygen. It should be added, however, that this statement needs modification, so as to admit that conditions which result from anoxemia do irritate the center. These conditions, however, are

produced slowly and in the tissues, not primarily in the center. Even to a total lack of oxygen the respiratory center makes no immediate response, although it may be killed thereby.

"The crucial experiment in this field is that of voluntary forced breathing. The experiment is so simple and easily performed, at any time, by any one, that it ought to become universally familiar. It is only necessary to breathe rapidly and deeply as you can (for several minutes). * * * Thereby you will induce in yourself a moderate degree of acapnia. When you cease the voluntary effort you may find that your hands are temporarily asleep. You may shiver, as in a chill. You will feel strangely lightheaded. * * * If your efforts have been sufficiently energetic and a considerable degree of acapnia has been induced, when you stop forcing yourself to breathe you will stop breathing altogether. In this respect the respiratory center is automatic. If you have previously reduced your store of CO_2 sufficiently, you will remain breathless and without desire to breathe until you turn blue in the face."

Hill and Flack have shown that by deep breathing of oxygen for two or three minutes and then holding the breath with the lungs full of oxygen, the breath may be held easily for astonishingly long periods of time, five to six minutes being attained by some subjects and as long as nine minutes in one case. Similar results have been obtained by Vernon. By forced breathing alone, the period of holding the breath was raised from 42 seconds to 4 minutes and 5 seconds. Hill and Flack found that the "breaking point" was reached when the CO_2 partial pressure in the alveolar air had risen to 6 to 7 per cent of an atmosphere and the oxygen fallen to 9 to 10 per cent of an atmosphere. Hill tells of the following event in this connection:

"In the case of S. E., the laboratory attendant, who ran, holding his breath after oxygen, 470 yards in 110 seconds, we noticed that he 'wobbled' in his course, and knocked his feet together in the last lap. We stopped him, or he would have gone on and fallen. Thinking he was faint, we bent him double and told him to breathe. He took no notice. On removing the clip from his nose he took a stertorous breath. We laid him on the floor, and after about half a minute he got up on a chair and looked around in a dazed condition, and recovered his senses in about one minute. He had been unconscious of all that had happened during this time. His color was good, and there was no cyanosis. When on the floor his pulse was found to be good. From the color of his face and the results of other analyses of alveolar air, there can be no doubt he had plenty of oxygen in his lungs, and we conclude that his alveolar CO_2 tension had risen to a point that he had become comatose, and was running automatically."

THE THEORY OF VENO-PRESSOR TENSION, CONTROLLED BY CARBON-DIOXID TENSION.

The carbon-dioxid content of the blood exerts (according to Henderson) far-reaching effects upon the circulation by its control of venous pressure.

"Crile, Romberg. and Pässler conclude (correctly, I believe) that in shock the circulation falls in the same manner as after hemorrhage, and that the heart fails because too little blood is supplied to it through the veins. They found that intravenous infusion restored for a time normal arterial pressure and heart action. Unfortunately they labeled this true picture with the misleading formula—the only formula offered by current physiology—vasomotor failure. Present knowledge regarding the vasomotor nervous system indicates that its control is exercised—mainly at least—upon the finer branches of the arterial system. Now the failure of vascular forms in traumatic and toxemic shock is almost wholly in the nervous system. Crile, Romberg, and Pässler saw and emphasized this fact. It seems not to have occurred to them that they were dealing with the failure of a mechanism as yet unrecognized in physiology. In this they were not alone. For half a century physiologists have been so dazzled by Claude Bernard's discovery of the vasomoter system that they have neglected to emphasize the fact that the circulation must involve a third factor in addition to the heart and the peripheral resistance of the arterial system. Otherwise it would be as unstable as a stool balanced only on two legs. It must include a mechanism, or mechanisms, regulating the volume of the blood, and determining the venous supply of the right heart. It is this veno-pressor system which is the essential element in the failure of the circulation in shock.

"It is so easy to record arterial pressure and so difficult to measure the minute volume of the arterial blood stream that one is inclined to forget that the pressure in the arteries is really a phenomenon of only secondary importance. * * * The primary function of the circulation is the volume of blood pumped onward by the heart in unit time * * *. The heart can discharge during systole only so much blood as distends its chambers during diastole. The diastolic filling of the right heart depends upon the volume of the stream flowing to it through the veins and upon the distending pressure which this stream affords. Venous pressure is, so to speak, the fulcrum of the circulation.

"The respiratory center, by regulating the CO_2 content of the arterial blood within narrow limits of variation, exerts an indirect but powerful control of the veno-pressor mechanism. Any considerable accumulation of CO_2 above normal augments the venous pressure. Excessive pulmonary ventilation tends to lower it. Acute acapnia

diminishes the volume of the blood as effectually as does an extensive hemorrhage."

Parts of Henderson's theory may sound strangely familiar to some of us. Over 20 years ago I recall the opening dictum of a professor of surgery in his lectures on shock, that shock was the "bleeding of a man into his own veins," but the theory of a veno-pressor tension finely balanced against a vasomotor tension, and heart force or blood tension, the former controlled by the stimulus of CO_2 partial pressure of the blood, seems to furnish a more comprehensive conception of the circulatory mechanism.

THE RÔLE OF THE SKIN.

Perhaps the best-understood function of the skin which would result in vitiating the confined air of a submarine is that which has to do with the excretion of watery vapor. Water vapor is likewise given off by the lungs. Speaking roughly, about 10 ounces are given off by the lungs and 20 ounces given off by the skin in a day (Notter and Firth). The amount, however, is largely controlled by two factors which greatly influence the activity of the sweat glands, and these two factors are (*a*) temperature of the surrounding atmosphere and (*b*) exertion.

The physiologic activities of the skin are many. Among other functions its sensory nervous mechanism plays a highly important rôle. Its participation in the regulation of body temperature can never be disregarded in any considerations of the hygiene of clothing or ventilation.

Although Malpighi in 1687 described the sweat glands it remained for Brechet and Roussel de Vanzeme in 1834 to direct attention to the functional possibilities which the excretion of water on the external surface of the body actually presents.

The size and the number of the sweat glands vary in skin areas. They are especially large in the axillæ and the groin. They are especially numerous on the palms of the hands and the soles of the feet. Krause estimates 2,800 orifices on a square inch of palmar integument and rather less than this on the soles of the feet. On the neck and back he found them the least numerous, numbering about 417 orifices on the square inch. He estimated the total number of the body at 2,381,248, and supposing the aperture of each gland to represent a surface of one fifty-sixth of a line in diameter he calculates a total evaporating surface of about 8 square inches.

Most of us are familiar with the simple test of placing the hand lightly upon a cold window pane and watching the rapid condensation of watery vapor where the skin was near the cold surface. Ever since the days of Sanctorius (1614) the expression "perspi-

ratis insensibilis" has been in use, and a question arises: Can water be lost through the skin in any other way than by the mechanism of the sudoriferous glands? In other words, is there a purely physical transport of water through the skin without the offices of sweat glands? This long-standing uncertainty was dispelled by a series of observations on human individuals in whom the unusual anomaly of complete absence of skin glands exists. Loewy and Wechselmann in 1911 had the exceptional opportunity of making such observations, and they found that such sweat-free persons may experience considerable output of water through the skin. The quantity may reach 600 grams of water per day for the entire body. This represents a true insensible perspiration—a diffusion of water vapor—following definite physical laws.

As a result of the investigations of Loewy and Galeotti and Macri in 1914 insensible perspiration is found to be greatest from the surfaces of the hands, somewhat less from neck and cheeks, and still smaller in relation to the chest and back. According to Galeotti and Macri there is a correspondence in some parts of the bodies of normal individuals between the number of sweat glands and the extent of evaporation from the skin.

Elimination by means of the skin deserves a more thorough study. There is a small amount of respiratory interchange of gases through the skin. In man the carbonic acid exhaled by the skin is about one one-hundred-and-fiftieth to one two-hundredth of that which passes from the lungs.

The reaction of sweat or insensible perspiration is acid, but in profuse sweating the reaction is usually neutral or alkaline. Kirkes gives the following compilation of several analyses:

	Per cent.
Water	98.88
Solids	1.12
Salts	.57
NaCl	.22 to .33
Other salts (alkaline sulphates, phosphates, lactates, and potassium chlorid)	.18
Fats (including fatty acids and iso-cholesterin)	.41
Epithelium	.17
Urea	.08

Perhaps a special matter with regard to the skin which deserves some notice is the peculiar and characteristic odor attributed to the volatile fatty acids. The odor so noticeable in close and ill-ventilated rooms is not unfamiliar to those who have suffered the experience. Our olfactory senses are so soon blunted that the odor may not be noticed by those inclosed in the room, but is unquestionably "cheesy" or "musty" to some one entering the space from an unvitiated atmosphere. The odors from the skin differ from different parts of the

body, as, for instance, from the axillæ or from behind the ears. This fact has lead to the suggestion that different areas of the skin may be charged with excretion of different kinds of waste products. Animals in whom the sense of smell is acutely developed have no difficulty in trailing or in identifying by an odor which must be beyond the average human perception. What rôle these concentrated odors may play in connection with a volatile protein or volatile fatty acid is problematical. But the odor of close rooms has led to the search for possible organic poisons given off by the human body, and attention has been more or less concentrated in a search for this substance in the respiratory exhalations. I have felt as I have reviewed the literature that the field of search should be broadened so as to include the skin in these investigations.

THE RÔLE OF A PROBABLE ORGANIC TOXIN.

About the middle of the nineteenth century an idea was conceived that expired air contained a substance in addition to carbon dioxid which might be detected by the sense of smell and which in concentration is a virulent toxin. This view seems to have been first put forward by Gavarret in 1851, who found that animals confined within a closed space died, although oxygen was supplied as fast as consumed, and carbon dioxid was removed as fast as formed. Hermans perhaps broadened this view by suggesting that it originated from the accumulation of organic substances from the skin and clothes. Billings, Mitchell, and Bergey still further extended the idea in 1895 in a Smithsonian contribution wherein they concluded that the discomfort of overcrowded and ill-ventilated rooms was a result of unpleasant odors, and odors had their origin from the volatile products of decomposition contained in the expired air of persons with decayed teeth, foul mouths, or certain disorders of the digestive apparatus, and they are in part due to volatile fatty acids given off with, or produced from, the excretions of the skin, and from clothing soiled with excretions.

All of these views have seemed to have reasonable foundation in fact, but up to date a searching scientific investigation of the various views has failed to produce valid irrefutable evidence of a tangible toxic substance. But there are those who are not willing to accept the explanation that the Black Hole of Calcutta, or the Austerlitz Prison, or the ship *Londonderry* produced their fearful results because of oxygen starvation, or CO_2 pollution, or through disturbance of the thermogenetic centers as a result of excessive heat and humidity.

The earlier views ascribed this probably toxic substance to a something contained in expired air. In 1867 Brown-Séquard and d'Arsonval, of Paris, gave a great impetus to investigation of this theory by

their experiments on animals. They connected a series of four air-tight cages by means of rubber tubing and aspirated a steady current of air through them. In each cage was a rabbit. The animal in the last cage of the series breathed the air which contained the respiratory products of the animals in the other cages, while the animal in the first cage was supplied with pure air. After a time the animal in the last cage died as a result of its confinement in the impure air, and a few hours later that in the cage next to the last succumbed. The inmates of the first and second cages survived. On placing an absorption tube between the third and fourth cages the animal in the last cage survived the experiment, while that in the third cage died. This seemed to indicate that the toxic substance in air was destroyed by sulphuric acid and was therefore probably organic matter. These experiments were repeated, with the same results, by Merkel in 1892. Du Bois Reymond gave the name anthropotoxin to this probable substance.

A number of investigators now took up the subject, among them being Dastre and Loye, Wellenhof, Geyer, Russo, Giliberti, Alessi, Lehmann, Jessen, Fromanek, Haldane and Smith, and Billings, Mitchell, and Bergey. Some of these investigators sought other explanations. One group believed the deleterious effect of foul air was due to the presence in it of ammonia compounds. At any rate the theory of the existence in vitiated air of an anthropotoxin appeared to be for the time abandoned.

In 1903 the question of a toxic substance in air was revived again by Wolpert. He showed that the excretion of CO_2 for a given time is considerably diminished in men obliged to breathe their own expired air over and over again. Then Peters discovered a peculiar unknown substance in the water of condensation from expired air, which gave rise to a slowing in the rate of the isolated frog's heart. Weichardt now took up the subject and attempted to prove that a high-molecular protein-cleavage antigen of the character of fatigue toxin (kenotoxin) was demonstrable in various solid and liquid excreta and in traces also in expired air. Weichardt's experiments were conducted mainly with mice and guinea-pigs. Inaba, who was associated with Weichardt in his early experiments, in carrying the work further was unable to interpret the toxic effects of the condensed respiratory vapor in the same way as Weichardt. In 1911 Rosenau and Amoss concluded that organic matter is demonstrated in expired air by the reaction of anaphylaxis. Expired air from men was passed through a cooling device and the condensed liquid collected. This was used to sensitize guinea-pigs. Of 99 animals injected, 26 reacted positively on the subsequent injection of normal human blood serum. In some cases death resulted in anaphylactic shock. The presence of a proteid in expired air of a higher molecu-

lar constitution than peptone was inferred. The quantity varies in different individuals. All precautions were taken to prevent contamination of the condensed air with protein from outside sources. It is assumed that this proteid is exhaled in a state of very fine colloidal suspension.

Weisman, reporting his work in 1913, failed to confirm the results of Rosenau and Amoss. He found that subcutaneous injections into guinea-pigs of either isotonic condensation liquid from human breath in amounts up to 20 cubic centimeters, followed by intravenous injections of human blood serum in amounts up to 0.5 cubic centimeters, or of isotonic condensation liquid from human breath, followed by intravenous injections of the same kind of material in amounts up to 3 cubic centimeters, with a suitable incubation period between both injections, did not result in anaphylactic shock. Likewise, intravenous injection of this liquid into human beings in amounts up to 8 cubic centimeters was not toxic. There was no evidence to show that the condensation liquid obtained from males is more toxic than from females, or that proteins are volatile. From the fact that the extremely sensitive anaphylactic test failed to show the presence of any sensitizing material in human breath, it is concluded that this material is not a factor to which may be attributed the ill effects of poor ventilation.

It is probable that the theory of an organic volatile poison, either from the lungs, the mouth, the digestive tract, the skin, or soiled clothing, will go to sleep again for a while and the secretory theory of oxygen within the lungs will come to the fore to explain the stimulating influences of fresh, pure air and the depressing influences of bad ventilation.

THE RÔLE OF BACTERIA AND DUST.

There is no belief more ancient in connection with medical science than the belief that the elements of disease may be transmitted by air. The terms such as "effluvium," "miasma," "contagium animatum," each applied to express a belief of transmission of disease through air, are falling into disuse or acquiring a new meaning. In surgery the opinion long prevailed that wound infection was dependent upon an atmospheric influence, and this view became dogmatic after John Hunter attributed the invariable absence of fever and suppuration in subcutaneous injuries, such as simple fractures, to the fact of their not having been reached by air. Before the light of modern bacteriology and the transmission of disease by insects, vermin, or by protozoa broke forth over the horizon of scientific conception, quaint writings teemed with theories and beliefs in an undefinable something contained in air influencing fevers and suppurations and causing disease. When Lister, in 1867, produced his first communication for

prevention of sepsis his antiseptic methods were directed against the air. With the carbolized spray he sought to destroy those elements of decomposition contained in air which exerted their pernicious influence on wound secretions and in the wound itself.

Already had the foundations with regard to the bacteriology of air been laid by workers each contributing some new fact.

Spallanzani had shown in 1769 that if meat infusions were placed in hermetically sealed flasks, into which no air might enter, and boiled for one hour the infusions remained sterile and did not decompose. But if the flasks were broken open and exposed to the air, decomposition was the result. Then Schultze, in 1836, was able to show that if the air were passed through sulphuric acid before coming in contact with the boiled-meat infusion, putrefaction would not occur. This seemed to show that it was freed of its essential power of putrefaction. Schwann the next year, 1837, accomplished the same result by passing the air through red-hot tubes; and Helmholtz in 1843 repeated and confirmed these experiments with calcinated air. Schroeder and von Dusch then, in 1854, showed that if air were filtered through cotton wool by simply placing stoppers of this material in the mouths of flasks before boiling, the contained liquid was incapable of producing putrefaction. This discovery has attained an important place in bacteriological technic, but it was the antiseptic theory of Lister, with regard to the prevention of suppurative processes (between 1863 and 1870), that gave impetus to the study of bacteriology, and since 1873, when Obermeier discovered the organism of relapsing fever, one pathologic bacterium after another has been isolated and adjudged guilty of transmitting disease.

It was Tyndall who, in 1876, laid down the general principles upon which our knowledge of organisms in air is based. His investigations upon the floating substances in air showed that in a closed chamber in which the air was not disturbed by currents all suspended particles settle to the bottom, the superincumbent air being optically pure. He demonstrated beyond all doubt that the presence of living organisms in decomposing fluids was always explained by preexisting forms either in the fluid or upon the walls of the vessels containing it, or by the liquid being exposed to air which contaminated it. Further investigation has shown that the degree of air pollution is dependent on the amount of dust contained therein, and that bacteria may be conducted through air upon particles of dust—"the raft theory." According to Aitken there are about 300 to 3,000 dust particles in a cubic centimeter of country air from Argyllshire, whereas that of London contains 48,000 to 150,000 in the same volume of air. In this connection it should be remembered that, though dust forms a vehicle for bacteria, dusty air is sometimes comparatively

free from bacteria. Ash-cart men, for instance, from investigations made in New York City, would appear to suffer less from bronchial affections than one would at first imagine, but ash dust is sterile.

The air in winter, when the ground is covered with snow, contains less bacteria than in summer. The air of large cities contains greater numbers of bacteria than does the country air. In damp weather the number of bacteria in general is less than in dry weather. In winds a greater number are present than in still air. In the middle of the Atlantic Ocean, and upon mountains in the Alps where the ground is continually covered with snow, the air is practically free from bacteria.

Germano, as a result of his investigations, classifies bacteria in three groups: First, those like the bacilli of plague, typhoid, and cholera, which can not survive drying for more than a few hours; second, those like the bacilli of diphtheria and streptococci, which can withstand it for a longer period; and third, those like the tubercle bacilli, which can very readily resist drying for months and yet retain their virulence. Groups 1 and 2 are rarely conveyed by air, while group 3 is frequently so conveyed.

The dust of city streets, contaminated by sputum of diseased human beings and the discharges of animals, has been investigated again and again, and perhaps needs no extended comments.

Prudden, in 1890, showed that the amount of bacteria in the dust clouds of ill-swept city streets is startling. After 5 minutes' exposure of the $3\frac{3}{4}$-inch culture plate, clean dust gave 10 to 35 colonies to the liter, blowing dust from 214 to 941, and, following the street cleaner, 5,810 colonies. These results have shown only too well the necessity for street flushing as compared to dry sweeping.

The source of air supply on board a ship at sea, free of the dust contamination which exists in streets of cities, would seem to make conditions of health ideal and free from the menace of bacteria of dust. And this is true to the extent that we may look for a variety of bacterial content similar to that represented by pollution from the crew.

Fecal and urinary discharges are so thoroughly disposed of aboard a modern man-of-war as to cause us little concern. Sputum can hardly be considered where sanitary regulations are enforced, while a diseased member of a crew can not remain undiscovered long with a vigilant medical officer. Perhaps the most fertile field for the culture of organisms is the skin.

Since Eberth, in 1875, demonstrated the presence of various bacteria in normal perspiration and described the colonies which they form on hairs, a number of investigators have interested themselves in the bacteria and molds of the surface of the body and as a result have discovered a profusion of organisms. The uniform body tem-

perature, the moisture of cutaneous and other secretions, furnish conditions favorable to growth. Based upon the investigation of the bacteria of the skin was evolved the present surgical technic of the skin preparation of the patient and the surgeon before operation.

Considering the large number of men per cubic foot of habitable space on board a ship the bacteria of the skin become a matter of special consideration, not only as bearing directly upon the health of the crew, but within submarines, where the intense bacterial pollution must have its influence, on the preservation of exposed foods—a notorious difficulty aboard these boats.

Haldane and Osborn, in 1902, in their inquiry into the ventilation of factories and workshops, made a number of bacteriological examinations, some of the chief results being shown in the following table:

	Cubic content.	CO_2 per 10,000 parts.		Bacteria and molds per liter of air.	
		Inside air.	Outside air.	Bacteria.	Molds.
Tailor, Whitechapel	67,500	35.8	3.5	17	22
Do	21,953	9.2	3.5	8	1
Do	2,750	4.6	3.5	16	2
Do	18,636	10.0	3.5	9	5
Do	9,800	7.4	3.5	9	0
Tailor, London E	27,265	14.6	3.5	10	2
Tailor, London E. C	26,460	14.6	3.5	25	3
Cap maker, London E	4,296	23.0	3.5	9	2
Dressmaker, London W	21,600	13.2	3.5	8	0
Boot workshop, London E	8,688	8.8	3.5	25	6
Railway works, Wilts	93,786	4.6	3.5	20	2
Chocolate works, Bermondsey	12,000	6.2	3.5	8	0
Newspaper printer, London E. C	24,098	16.5	3.5	9	4
Do	45,259	15.2	3.5	6	4
Do	23,582	25.4	3.5	10	3
Ropemaker, Chatham	....	....	....	20	6
Do	....	....	....	82	8
Do	....	....	....	850	18

In 1910 the writer made some bacteriological examinations of the air of the living compartments of the *Delaware*. The ship as a habitation has important features with which there is little similarity encountered in a habitation on shore. A given compartment was assigned to a number of men, which compartment had a varying amount of cubic feet of air space per man of the crew from 106.02 to 239.10, the average allowance being 187.73 cubic feet per man. This very small allowance was increased by two factors, and these factors were: First, men absent from their billets by reason of being on watch; and, second, when in port the absence of men from billets by virtue of being on liberty. We thus have two periods—one while the ship is at sea, during which the average corrected allowance per man is 236 cubic feet, and a period when the ship is in port when the average corrected allowance is 298 cubic feet per man.

The following table shows the results of examinations made at night when few people were stirring and dust must have been in minimum circulation:

Compartment.	Time of exposure of plate.	White.	Pink.	Mold.	White.	Pink.	Mold.	[illegible] in compartment when plate was taken.	Cubic air space in compartment.	Berthing space provided.	Bacteria per cubic meter.	Remarks.
	Minutes.											
Outside air	5	1			1							Stiff wind blowing over decks at time.
B102	5	7			9		12	4		23	2,100	43 men mess in this compartment.
Sick bay	5	5			3	3		14	4,400	20	1,400	4 cases of tonsillitis in sick bay at time.
Brig space	5	2			3			0	1,844		300	One berth-deck compartment in which no tonsillitis had developed.
Gun deck forward	5	11			6	8		25	14,000		1,400	Natural ventilation through air ports.
Gun deck mid	5	4			4	1		14	4,364		500	Ventilation through gun ports.
C108	5	18			6	15	3	15	2,227	20	2,400	
C102	5	1			78		1	9	3,248	26	2,900	
A112	5	5			3	(?)		3	6,200	40	(1)	Innumerable pink colonies on plate.
D109	5	4				(?)		12	8,500	58	(1)	Do.

[1] Innumerable.

NOTE.—These observations were made at midnight when the air was comparatively quiet.

The Petri rough method for bacteriological examination of air seems to give results sufficiently uniform for practical purposes of estimation in ship's spaces. This method is described by Stitt as follows:

"Exposure of a lactose-litmus agar plate (capacity, 100 square centimeters) for 5 minutes will give the number of organisms present in 10 liters of air. Multiply by 100 for 1 cubic meter.

"The two groups of organisms usually found in air are (1) bacteria and (2) molds. Molds (spores) may be carried by currents of air; bacteria, however, are generally carried about by particles of dust or finely divided liquids (spray). On the lactose-litmus agar plate staphylococci and streptococci show as bright red colonies."

But when this method is used it must be remembered that the tendency of dust is to settle, and that the superincumbent air will contain the least number of organisms, so the distance from the deck must be noted and maintained at uniform height. If one were examining air under working conditions this height should be about 5 feet 4 inches. For sleeping conditions, as the sailorman swings in a hammock, a greater height may be considered necessary.

At night dust is not apt to be in motion to the same extent as in the day, and the bacterial count will under these circumstances be less.

A number of investigations have been conducted to determine the bacterial content of inspired and expired air. In a report to the Smithsonian Institution (1895) it was concluded that "In ordinary quiet respiration no bacteria, epithelial scabs, or particles of dead tissue are contained in the expired air. In the act of coughing or sneezing such organisms may probably be thrown out." This has since been confirmed in investigations by Flügge and others. The moist mucous membrane, lining the mouth and upper respiratory passages, effectually removes all bacteria from inspired air. Hewlett and Thompson have estimated that from 1,500 to 14,000 bacteria are inspired every hour and have to be taken care of by the membranes of the upper respiratory tract. They found mucus from the wall of the trachea germ-free, and by experiment with the *Bacillus prodigiosus* were able to demonstrate a bactericidal power of the healthy Schneiderian membrane of the nose. The following facts enumerated by Newman may be considered as representing the results of investigations in this subject:

(*a*) That air may contain great numbers of bacteria which may be readily inspired.

(*b*) That in health those inspired do not as a rule pass beyond the moist surface of the nasal and buccal cavities, except in persons who practice oral instead of nasal respiration.

(*c*) That in the nose and mouth there are various influences of a bactericidal nature at work in defense of the individual.

(*d*) That expired air in normal quiet breathing contains as a rule no bacteria whatever.

But the bacteriology of the air of the battleship and the submarine is a subject worthy of further study. This is true if for no other reason than the high sick rate from tonsillitis, which disease has for years occupied second place in the Navy admission-rate statistics, being only exceeded by the admission rate for gonorrhea. The tonsillitis aboard our battleships is probably dependent largely upon the bacterial content of the living spaces. The large number of human beings per cubic foot of air space supply on the surfaces of their body a culture medium for bacteria, the surface moisture and body heat contributing to their growth, they ultimately reaching the atmosphere through drying in soiled clothing and bedding.

A SHORT STORY OF MY EXPERIENCE AT THE RED CROSS AUXILIARY NAVAL HOSPITAL OF HAMBURG, GERMANY, DURING THE FIRST EIGHT MONTHS OF THE PRESENT WAR.

By H. G. Beyer, Medical Director, United States Navy, Retired.

The outbreak of the present war in Europe, in the early summer of 1914—the year of ill omen—found me a student of hygiene in the laboratory of Prof. Max Rubner, at Berlin. Germany was placed under martial law on July 31, 1914. It was a tragic moment for Germany. The common danger welded the German people together into one huge living organism, as if by magic. Questions arose involving millions of human lives, of hundreds of burning towns, and of the destruction of the hard-earned fruits of many years of labor. The menace hung heavily over the people of the breaking up of the Empire, of death, of poverty, and above all of slavery, when, on August 2, the order of mobilization was published, which meant the beginning of the present world war.

From that day on my interest in laboratory work began to wane. I commenced to think more and more of the long lines of splendid looking men, in their field gray uniforms, that were marching, day and night, through Berlin in the direction of the numerous railway stations, singing their patriotic songs; likewise, to realize in what condition they must return after a battle, if at all. I wanted to set aside test tubes for a while and become a doctor once more. Indeed, the desire for assisting in the work of repair of the crippled and wounded, no matter what part of the world they might hail from, became compelling and overpowering. I began to take steps accordingly. After successfully overcoming some of the technical diffi-

culties in my way, and, with the approval of our Embassy at Berlin, I finally joined the Red Cross. In the words of Mabel T. Boardman:[1]

"Under this banner we may all enlist. By international agreement, we break no neutral duty, when we lift our arms in service. By international agreement, no weapon can be raised against it. It floats triumphant over the passions of war, the emblem of humanity, the insignia of the brotherhood of man."

The administrative headquarters of the German Red Cross service at that time were located in the Reichstagsgebäude. From that office I received a request, dated August 13, 1914, to report to the territorial delegate of the Red Cross service, Mr. Max Schinkel, at Hamburg. Arrangements for my departure from Berlin having been completed and the naval attaché informed of my future address, I started for Hamburg on August 16, taking the 5.56 p. m. train, arriving in Hamburg at 6.07 a. m. the following morning.

On reporting my arrival at 10 a. m. of the same day to the territorial delegate, Mr. Max Schinkel, I, there, met Marine-Generaloberarzt Dr. Rhode, who was at that time in command of the Red Cross auxiliary naval hospital, to which latter I seemed destined to be assigned for further service. Dr. Rhode very courteously invited me to ride with him to the hospital; he spent a large portion of the day in introducing me to the staff, showing me around the hospital, and in making me acquainted with the general administrative machinery by which it was run.

The site of the hospital is that of the emigration halls of the Hamburg-American Line of steamships, at Veddel-Hamburg, and which it had been the duty of Dr. Rhode to convert into a hospital for service during the war, a task which Dr. Rhode seemed to have accomplished with great successs, within the brief period of five days, as he informed me.

Henceforth, I was one of the assistant surgeons of the hospital, duly installed, and during the first six weeks assigned to wards A and B, which were reserved for the lightly wounded (*Leichtverwundete*, *petits blessés*). Toward the end of the sixth week of service in those wards I was turned over to Prof. E. Lexer, one of the Oberstabsärzte—now Generaloberarzt—of the Imperial Naval Reserve, and thus became during the remainder of my stay at the hospital one of his constant daily assistants in operating room 1. It would, perhaps, be savoring of egotism on my part were I to continue speaking in detail of my relations to the 64 colleagues on duty at the hospital and with whom I sat down to my daily midday meal. I can sum up this portion of a short story by stating briefly,

[1] The Red Cross Flag, The Last Ray of Civilization. "Inter arma caritas." The American Red Cross, ix, No. 4, October, 1914. War number.

truthfully, without bias or prejudice, that this was an association the individual members of which felt bound by ties of unquestioned mutual respect and professional helpfulness; among whom the performance of a duty meant perpetual pleasure and never-failing interest. Indeed, I do not remember a time or place during my whole naval service of nearly 40 years being in any company of medical officers among whom mutual respect for rank and seniority, mutual helpfulness in a professional way, were more conspicuously, more invariably, and uniformly observed than here. We were comrades all, but comrades with a difference in rank based upon selection by merit alone. Every officer and man seemed to be acting automatically on this principle, the result of years of earnest training.

During the first four weeks after the outbreak of the war but few patients were received at the hospital. For a large hospital of 3,000 beds, 300 patients do not signify a great many. It was, therefore, an easy matter to get a day's leave. Referring to my diary, I find that on September 4, I took the noon train for Kiel, on invitation by my friend, Marine-Oberstabsarzt Dr. zur Verth, at the time in command of the new hospital ship *E*. After enjoying a most thorough inspection of this ship in all its parts, I returned to Hamburg at 11 p. m. of the same day.

On September 5 one of the larger hospital ships brought a number of wounded from Cuxhafen to Hamburg. The ship being obliged to anchor in the river some distance above the hospital, it required, to begin with, several large lighters, in order to bring the wounded near the different shore landings. The lighters were made fast alongside the hospital ship, the patients, on their stretchers, lifted over the railing and lowered down to the broad, flat bottoms of these vessels. The latter were now towed to the shore landings and the patients in them moved on shore by the Red Cross division of Hamburg, which had had charge of their transport up to this point. After the landing, the Red Cross people were relieved by the hospital corpsmen on duty at the hospital, and by them removed into the large reception hall, whence they were finally carried into the special wards, into which, in accordance with the character of their injuries, they naturally belonged, for further treatment. I believe that no one, either physician or layman, who had seen and watched these men at their work, could have helped admiring the splendid system of division of labor, the intelligent handling of the injured, the quiet coöperation between them, which was here seen in practice. Every step in the work was done noiselessly and without hurry. Not a single word of command was heard, not a single man uttered a sound nor asked a question. Every man's attention seemed pinned and concentrated on the work which he was doing. These men all knew their duty, understood their work and needed no further command or in-

formation and none was given. Their drills and training had been done elsewhere, on previous days, and done thoroughly.

September 6 treatment was begun on about 20 new patients admitted to the hospital and received in my ward on the afternoon of September 5. Their injuries consisted of explosive wounds, caused by grenades, several cases of burns and scalds, caused by burning gases (*Stichflammen*). These consisted, in part, of superficial scalds, with a deeper central scar, from which the epidermis had been torn off, exposing the deeper tissues, partly, of extensive suppurating surfaces; still others showing already healthy granulations. Such injuries were noted on the head, chest, and the extremities. The most serious of them were those found on the lower extremities.

On September 26 a party of medical officers from our hospital was invited to inspect a new hospital train just completed and fitted out and equipped with great care by the Hamburg-American Line, which party I joined. This train consisted of 32 cars, furnished with comfortable beds, two tiers on a side, with ample storerooms for provisions, complete kitchen, operating room, pharmacy, officers' and nurses' quarters, and a small inclosure filled with pipes, tobacco, cigars, and cigarettes. A central passage, with doors at either end, in the cars made communication between them all easy. The whole train could be considered as a fully equipped emergency hospital on wheels both with regard to personnel and material.

On October 3 Dr. Lexer, assisted by Dr. Otto Cohnheim and myself, did an operation for the transplantation of an entire leg of a dog to the freshly amputated stump of another dog. The amputated leg had been carefully perflated with warm normal salt solution and kept warm by being wrapped in gauze saturated with the same solution. The bony stumps were united by a bony internal splint, the respective nerves and principal vessels united by suture and the dog strapped to his extemporized stretcher. Although the operation itself seemed quite successful, our dog died on October 4. The operation was an experiment and performed by Lexer more with a view to demonstrating to his assistants and nurses his methods of bone transplanting, of nerve and vessel sutures, and as a preliminary to what was to follow, than to the making a success of the operation itself.

Since the expected naval operations in the North Sea did not materialize and our hospital had in consequence opened its doors to soldiers as well as sailors, the hospital was soon filled with wounded from the eastern as well as the western battle fronts. Most of our patients began to arrive in hospital trains instead of in lighters, and it became the duty of some of us to witness their arrival at the different stations in Hamburg. Thus it happened on October 18 that

some of us had an opportunity of witnessing the arrival of a long hospital train at the Hanoverian Station at 12.15 a. m. At that hour 250 uniformed Red Cross men stood ready on the platform for unloading the seriously wounded, expected to be about 200 in number. The train moved into the station in two divisions, one for each track, alongside of a central elevated stone platform. Scarcely had these trains come to a halt when these 250 men, without noise, without audible words of command being given, suddenly divided into ambulance squads, one in front of each of the cars, and could be seen at work unloading the wounded in their stretchers or assisting those who were still able to walk into the refreshment rooms. Thirty large autos, each accommodating four stretchers, were ready to receive their charges and take them to the different city hospitals, moving along promptly, almost noiselessly, after being loaded. The entire trainload of wounded was well under way to the hospitals, the platform of the station clean as before, and free from the slightest trace indicating what had just taken place. Neither physician nor Red Cross man was any longer to be seen; an ominous, almost funereal silence reigned throughout the big station. All this was done within the short space of 20 minutes from the time of the arrival of the train, which even now was seen moving out of the station as slowly and noiselessly as it had moved into it 20 minutes before. The unloading of this entire train had taken no more time than that of a single car.

Call it foresight, drill, training, preparedness, organization, or whatever else such a result would lead you to designate it, the facts are that the number of cars, the number and kinds of the wounded, their needs and immediate requirements on arrival, must have been made known to the heads of the Red Cross service and those of the various hospitals at Hamburg long enough beforehand in order to enable these to prepare in so perfect a manner for such a reception. A sight I shall never forget. It was 1.15 a. m. when I returned to my hotel that night, pondering over what I had just seen. Many were the trains that I witnessed arriving in Hamburg after that. I have never once met with an instance that would change my first impressions nor my description of them.

Solemn and even dreadful as may be the first impressions on witnessing the arrival of the wounded in hospital trains, their unloading and transfer to the hospital, their patient and silent suffering as shown in their facial expressions, it is, nevertheless, remarkable how soon these wear off and one gets used to them.

Physicians and surgeons, both civil and military, while undergoing their first experience in a base hospital during a war, may sometimes wonder at the apparently trivial character of the injuries

exhibited by patients arriving in hospital trains and at how little, after all, the work and the cases they have to treat differ from those in a civil or military hospital during peace times. With the exception of a small percentage of cases that could occur under no conditions other than those presented on a field of battle and the numerical preponderance of gunshot over other injuries, the principles and the practice remain the same. A very brief experience at the battle front, however, would have been sufficient to absolutely inhibit such reflections.

Before proceeding, therefore, in the narrative of my hospital experiences, it may be conducive to a better appreciation by my readers if I invite them to glance over the field over which our patients have to travel and the process of selection to which they have to submit before they find their places on hospital trains.

The soldier, injured during a battle in the field, is carried, or walks, first to one of the numerous first-aid stations (*Hilfs- or Truppenverbandplätze, postes de secours*), where he receives his first attention. First-aid work within the fire zone has, practically, been abandoned, because unprofitable. Even in the trenches such work is now rarely encouraged, although still done by many. Here, hemorrhage is arrested by bandages; open wounds are covered by aseptic gauze, held in place by bandage; the dressings sometimes glued to the surrounding skin by mastisol to prevent slipping during transport. Fractured bones are done up in splints; patients with head and chest wounds, as well as abdominal wounds, after being dressed, are strapped to the stretchers and receive an injection of morphin. Special attention is given to refreshments and everything done for the patient's comfort, which is being considered a most important part of first-aid treatment.

From the first-aid station our patients walk or are moved to the main dressing stations (*Hauptverbandplatz*). Between the first and last a distance from 6 to 10 kilometers may intervene. It is here where the motor ambulances begin to be active. Here, also, the wounded experience their first classification. All those able to walk go to a place marked A, and those having to be carried go to B, the station reserved for the seriously wounded. When leaving the main dressing station, which is the first clearing place, they are again classified and receive their tags (*Wundtäfelchen, fiches de diagnostic des blessés*), and are moved into one of the nearest field hospitals (*Feldlazarett, ambulance de campagne*), perhaps the most changeable and varying of all the units in the field. Although the wounded are here supposed to receive their first hospital treatment only the most urgent operations are done, and all tentative and plastic work is omitted, being left to be done by the surgeons at the base or home

hospitals, the final destination of all the more seriously and transportable wounded.

From this hurried and incomplete survey of the history of our patients between the firing line and the base hospitals, it is already to be seen that, during the entire time occupied by their transport to the home hospitals and all that this implies, the dominant principle of action is to save life and to avoid everything in the nature of a more serious operation from being performed on them which would tend to delay their safe arrival at home. The whole process of the treatment of the wounded in the field is becoming more and more reduced to a prompt, humane, and safe process of evacuation of them from the field of their activity to the base hospital, to be done on the highest principles of humanity and science alike to save the life of the men and for the purpose of relieving the troops in the field from the presence and the care of the helpless.

From these considerations it also follows that the field hospitals are occupied by the seriously wounded (*Schwerverwundete, grands blessés*) that are considered as nontransportable. All the others, the slightly wounded, those who require a prolonged treatment and convalescence, the seriously wounded that are transportable—these are the patients that arrive in the hospital trains and appear for treatment in the military and naval hospitals at the base.

Fauntleroy,[1] under the name of *depôt d'éclopés*, describes and figures certain places in the rear of the French army reserved for the recovery of some of the slightly injured who are intended to be returned to the firing line in a short time; although I am unable to find their equivalents either in the German or the United States organizations, I should say that ample provision for such patients should be made, if such places are not already provided for, in any future reorganization of our service.

The observant student of preventive field surgery, of first-aid methods and stations, of the transport of the injured from the firing zone through the different dressing stations and field hospitals to home hospitals, will at some future day discover that many new conceptions have been formed, many new devices invented, both at sea and on land. While the time is not yet ripe for pronouncing final judgment on these, of one thing we may be sure, namely, that they are not the creations of mere imagination, but the experimental results of field conditions under fire.

Under the more or less constant rain of bullets of a modern battle, temporary and advanced dressing stations must be erected in a fairly protected place. A good road, to permit a constant evacuation, with a minimum of risk from shell fire, in telephonic communication with

[1] Report on the Medico-Military Aspects of the European War, 1915, p. 33.

brigade and divisional headquarters and with, of course, the usual equipment, is a necessity of prime importance.

For first-aid and other dressing stations, houses when possible, but cellars and dugouts when under shell fire, must be resorted to. But of all the sanitary field units, that of the field hospital is subject to the most varying fortunes, moving constantly between the extremes of adaptability. At the heels of a rapidly advancing army the field hospital finds itself, within three to four days, in the most primitive quarters, called upon to meet a constant current of hundreds of seriously injured, most of them at close range, and obliged to confine its function to the making of these, that can be so made, transportable.

Then, again, the field hospital may enjoy the ideal conditions prescribed by a home hospital of semipermanency—stationary for months, good accommodations, satisfactory service, good arrangements as to equipment, and in a position for treating its inmates according to the accepted rules of hospital treatment as well as expediting all the lightly wounded to the rear in safe and comfortable dressings. Many are the conditions between these extremes. An abandoned castle, a barn, dance hall, church, stable, schoolhouse, farmhouse—any place guaranteeing temporary protection—may have to be chosen for establishing a field hospital.

Hospital ships in the different harbors or at sea near the shores may be observed in daily exercises, drilling their crews in the use of new devices and new methods of fishing up the injured out of the waters, under varying conditions of wind and weather, of transporting them to barges and from barges to the hospital ships.

At some future day, also, when the medical history of this war shall have been written up, an interesting chapter will be found devoted to the work of the auto in use in the fire zone (*zone de l'Armée*). Many of these auto guides—*Benzine Leutnants*, as they have been styled by the men—have, indeed, earned the Iron Cross they are so proud to wear. Their cars, perforated as they are by shrapnel balls, bear testimony of the many dangers to which these men were exposed and the many hair-breadth escapes which they made near the enemy's lines.

ROUTINE WORK AND INCIDENTAL OCCURRENCES AT THE HOSPITAL.

In the first place, the departure of those of us residing outside the hospital, was so timed from town, as to enable us to stand ready for work, sterilized and gowned, at the operating table at 8.45 a. m. This daily routine was followed with clock-like regularity and departed from only under the most exceptional circumstances. Fürbringer's method of hand-and-arm sterilization was scrupulously carried out and insisted upon. Lexer insisted upon the use of nail

cleaners during and not after the act of scrubbing hands and arms by all who took part in an operation. Gloves were obligatory. A short résumé of the occurrences on a few typical days at the hospital and in operating room No. 1 must suffice for the short account to which I am limited.

October 26.—Assisted in five different operations this morning; all serious cases, consisting of destructive bone-and-joint injuries. Shrapnel balls and grenade splinters of all sizes and dimensions, deeply embedded in bones and soft parts had to be removed.

Incidentally received complete charge of a small ward of prisoners consisting of 10 French and Belgian officers, most of them slightly wounded, with the exception of one who had been thrown quite a distance and contracted hemato-myelia in the lower spinal cord.

At 1 p. m. a portion of a hospital train arrived with 130 wounded, all of whom were transferred to the hospital within half an hour of their arrival; the remaining half of this train came in at 4 p. m.

October 27.—(1) Operation for removal of a French small-caliber projectile from the lower end of the femur, projecting with its top into the cavity of the knee joint. The soldier had been lying on his stomach, ready for firing, the projectile had entered the thigh from behind, at a point of junction of the lower and upper two-thirds, exactly in the middle line, had entered the thighbone, almost parallel to its long axis, pushing its way toward the knee-joint until half of it projected into that joint; the other half remaining embedded in the femur. The knee-joint being opened, it was extracted without the least difficulty. The wound was closed by suture and dressed.

(2) Operation of puncture of lateral ventricle in the case of a skull wound with partial prolapse; also, puncture of lumbar cord with subsequent injection of 40 c. c. of antitetanic serum into the latter.

(3) Dressing a perforating chest wound; also a perforating wound of the foot, same patient.

(4) Removing stitches from a case of appendicitis on fifth day after operation in the person of a prince.

October 29.—At 12.30 this morning witnessed the arrival of a long hospital train at the Hanoverian Station, carrying about 65 seriously wounded and 335 slightly wounded. Operations—

(1) Nerve suture; concerning an injury to the median nerve in the axilla. About 2.5 cm. of the nerve had been carried away, making it impossible to bring the two ends together by suture. The two ends were tucked into the respective ends of an excised piece of axillary vein and held in place by suture. Next, a good-sized piece of adipose tissue was taken from the left thigh, subcutaneously, and with this the radial, ulnar, and patched-up median nerves were surrounded and the wound closed.

(2) Resection of knee-joint for total destruction of joint surfaces.

(3) Exposure and partial resection of lower jaw, preparatory to future bone transplantation.

At noon to-day, during the luncheon hour, Generalarzt Dr. Rhode, our chief in command, announced that he had been detached and ordered to make necessary arrangements for establishing a hospital in connection with the second naval division in Belgium, an event which was followed by a small farewell dinner in his honor at the Atlantic Hotel.

On the same afternoon another hospital train with about 200 wounded arrived at 5.40 p. m., all from the neighborhood of Lille, France. All these exhibited the traces of long suffering during a tedious transport; on one of the cases the carotid had to be ligated at once.

October 31.—After receiving 211 wounded at 4 p. m. on October 30, five operations were done during the forenoon: (1) Hernia; (2) removal of grenade splinters; (3) removal of necrosed tissue from the os calcis; (4) operation on a complicated fracture of the tibia with a large flesh wound; (5) operation on a perforating abdominal gunshot wound, lacerating the ascending colon. A piece of the os pubis had been detached and driven through the bladder into the lumen of the sigmoid flexure, where it was found and removed.

November 17.—(1) Operation for axillary aneurism, complicated by rupture of the median nerve and loss of a section of the axillary artery. The ends of the median nerve were united by suture, a piece of the saphenous vein was used to fill up the gap between the two ends of the axillary artery. This operation lasted 2 hours and 20 minutes, was attended by considerable loss of blood, and salt solution had to be injected.

(2) A German small-caliber projectile was extracted from one of the Belgian officers in my ward; it had lodged deeply in the muscles of the back, near the vertebral column, in the region between the two shoulder blades. The projectile was absolutely smooth and undeformed. The wound shortly afterward healed by primary union.

November 19.—One operation for hernia; two operations for the removal of extensive cicatrices in the palms of hands, involving index and middle fingers, followed by the free transplantation of new tendons for these fingers. Lastly, trephining was done for the relief of pressure, on account of existing paralysis of legs and arms (classical method).

In the course of intervening periods of time many more operations for aneurisms, lung-hernias, and trephinings were done, a brief description of which would be unsatisfactory. I will, therefore, close my narrative of my experiences with a description of the methods of bone transplantation, as used by Lexer, and of which I have carried

home the most vivid and the deepest impressions. Thus, for example, on December 5, one of these operations, which may be taken as typical, was done on the left femur, completely shattered into splinters through its middle. When the case came on the table partial union had taken place in an angular position through the new formation of callus. Suppuration having come to an end, a deep incision was made on the outer side of the thigh, down to the bone, through all the soft parts and the periosteum. The bone was refractured, loose bony splinters, detached from periosteum, were removed, the two fragments of the femur returned to their normal position by extension and counterextension, and a long piece of tibia, with its periosteum adherent to it, was interposed between the two femoral fragments and its ends introduced into the respective marrow cavities of the fragments. The entire limb having been brought into the normal position, the soft tissues were united by several layers of sutures; first, the periosteum, then the deeper muscles, next the superficial muscles and fascia, and lastly the skin. A fenestrated plaster-of-Paris dressing from the waist down to the foot completed the operation.

A similar operation was done on December 8 for a complicated fracture of both radius and ulna, near the wrist joint, the result of a perforating injury by a French projectile, at close range, and which may be accepted as typical for injuries of that class in the arm. Both bones of the forearm were found to be much splintered, the splinters driven into the neighboring soft tissues. A long piece of rib was cut out and split lengthwise, in order to make one of the pieces fit into the previously prepared marrow-cavities of both fragments of the radius. The same being impossible to be done in the case of the ulna, the other piece of rib was simply wired to the outside of the ends of the fractured ulna. The bones of the forearm having been placed in the normal position, the soft parts were united by suture and the arm held in position by a suitable splinted dressing for rest and subsequent healing.

Reviewing my past experience in the hospital at Hamburg, the operations which concerned the free transplantation of tissues, such as nerves, vessels, fascias, fatty tissues, skin, periosteum, and bone have left the most enduring impressions. Prof. Lexer, having acquired quite considerable experience and reputation in plastic work of this nature even before the war, made the most extensive use of it in the hospital at Hamburg. Thus, lost portions of the lower maxillary were replaced by pieces of rib, straight or curved (autoplasty). Upper and lower lips and chin-coverings were taken and transplanted from the forehead and scalp. Portions of the tibia and fibula were employed for splinting, either internally or externally,

with or without periosteum, as the cases required. Periosteum was transplanted to cover exposed portions of bony splints having no periosteum of their own. Large layers of adipose tissue were used between nerves, vessels, and the articular ends of bones to prevent adhesions, on the one hand, and to facilitate the after-development of motion in resected joints on the other. Small sections of lost vessels and nerves were replaced by transplants from other vessels and nerves of the same subject. The free transplantation of tendons to replace lost extensors and flexors in hands was an almost daily occurrence, so that Lexer frequently was heard to pronounce it *langweilig*.

In all such operations extensive use was made of local anesthesia with a solution of novo-cocain, containing an addition of synthetically produced suprarenin, which solution remains unaltered in the process of sterilization. The results of all these operations were, speaking generally, very satisfactory, some of them splendid. The lessons they teach are eminently noteworthy and full of promise for the future development of preventive surgery and preventive crippledom; that they may be seriously taken into consideration by the rising generation of my colleagues of the two services was one of the principal aims of my story.

DIAGNOSIS OF ABDOMINAL PAIN.

By W. A. Brams, Assistant Surgeon, United States Navy.

The diagnosis of abdominal pain has always been a most difficult and formidable undertaking. The difficulties are increased by the many new and rapidly developing laboratory methods which, although of great value, are as yet in the embryonic state if we are to judge by their rapid development and improvement in the past few years.

The innumerable methods at hand are not always infallible, nor is any one of them intended to be the determining criterion in a given case, any more than any other single clinical or laboratory method in disease of other portions of the body. The failure to recognize the principle that *a diagnosis rests on a symptom-complex, rather than on the presence of one particular finding, and that the grouping of the clinical and laboratory findings is the basis of a correct diagnosis*, has led many to grave error. It is in this connection, also, that I wish to point out the not uncommon tendency in a puzzling or difficult case to be unusually swayed by some new and untried method which has but recently been brought to the attention of the medical profession. No such measure was ever intended to become a panacea for universal application in any doubtful case, and we must be very careful not to regard a new method as such.

In discussing diseases of the abdomen, the value of a thorough ıd careful history can not be emphasized too strongly. This ap- ies especially to service conditions, where one must make use of eans which are at hand, and the most convenient are the history ıd physical examination. It is along these lines, therefore, that ; should aim to improve ourselves, that we may the better be en- led to make a correct diagnosis with the limited means on board ip and at outlying stations.

It is the purpose to bring the importance of the clinical history a case of abdominal disease to the foreground. The physical amination of the thorax is often the deciding factor in lesions that region, frequently to the exclusion of a minute history; but ıen we consider the difference in the anatomy and physiology, the sence of a bony framework, and the many other factors which ıke the methods of examination so different in the two regions, it comes apparent that something more than a mere palpation of) abdomen, often hastily made, is necessary. In disease of the lomen the history is often of greater value than the examination. ıis is especially true in the less typical cases, when the clinician ısiders the difficulties of making the examination, owing to the eat variation of the normal limits of size, shape, etc., of the con- ned viscera.

Perhaps the most common symptom presenting itself to the medi- man, and the one that concerns the patient most, is abdominal in. It will be the object of this paper to discuss briefly an outline a method for taking a history of a case which offers as the present- ; symptom abdominal pain.

The controversy as to the origin of the pain, whether it is of ceral, parietal, or reflex origin, properly belongs to the realm of ysiology, and will not be discussed here.

Before attempting to diagnose the cause of the pain, we must first ollect that it may be either local or referred from some other part the body, as for instance the lower thorax or spinal column. This uld be kept in mind constantly, until a final diagnosis is reached.

In order that no important portion of the history may be over- ked, the following order or some similar scheme should be lowed:

. Character of the pain.

. Location and extent.

. Time relation of pain to other symptoms, and the symptom- nplex.

. Effect of various factors such as food, vomiting, defecation, etc.

. Course of the pain, including onset, resolution, relapse, etc.

. Physical examination.

CHARACTER OF THE PAIN.

The determination of this feature will often furnish a clue as to the origin of the pain. It is also well to remember Cohnheim's axiom in this connection, "that an organic lesion causes a pain which shows some constancy in its location, character, area, and relation to other symptoms, and is usually severe in degree. A functional pain on the other hand, has none of these constant and definite characteristics; and the nature of the complaint is not clear-cut, it being best described as a vague, painlike sensation, rather than a severe actual pain." Of course, as elsewhere, this rule is very elastic, and should simply serve as an aid and not as a sole determining factor. Having determined this point it is necessary to determine the character of the pain that the patient complains of.

Generally speaking, there are about four rough groups of pain. These groupings are arbitrary and are classified in such a manner simply for convenience as follows:

1. Colicky.
2. Burning or gnawing.
3. Throbbing or aching.
4. Vague, dull, and indefinite.

Without offering any leading questions, the patient should be asked to describe his pain. Should this be unsatisfactory, the five types enumerated below, with a short description of each, should be offered the patient, and he should be required to tell which one corresponds most closely to the pain suffered. The following is an example of such a classification and description:

1. Colicky pains.—A griping pain, usually severe. Characteristically some pain is continuously present, and, in addition, frequent acute, periodic, and intermittent exacerbations occur, which are very severe and may cause collapse. Such is the pain resulting from occlusion of a hollow viscus, be it by spasm of its musculature or obstruction by mechanical means or by products of inflammation. By considering the underlying pathology it can be seen why such a type of pain should occur only under these conditions, and in such organs or tissues. In this condition the presence of a foreign body, irritation, mechanical pressure, or other cause produces that portion of the colicky pain which is continuous and more mild. Superimposed, as it were, upon this come the periodic attempts of the organ to relieve itself of the obstructing agents, by increased efforts of contraction, causing the resulting clinical manifestation of the acute intermittent exacerbations noted before.

In this category is the pain resulting from complete or partial obstruction of the gastro-intestinal tract, the gallbladder or its duct, the pelvis of the kidney or ureter, and in that stage of acute or recur-

rent appendicitis, usually early, where the lumen is obstructed either by the products of inflammation or accumulation of a foreign substance, and before marked peritoneal involvement has set in, giving rise to the well-known appendiceal colic. If the lumen is not obstructed in the early stages of appendicitis, but simply a catarrhal inflammation of the mucosa is present, then the resulting pain will not compare with the kind being described.

In this connection it is worthy of note that for some unknown reason the two following exceptions are not infrequently present and should be kept in mind: First, an incomplete pyloric obstruction will often not give the picture of a colicky pain. Secondly, a carcinoma of the large intestine, low down, or of the rectum, high up, will often not show any symptoms of obstruction for a considerable length of time and then suddenly appear with the typical symptoms of an acute ileus.

I have seen two cases of carcinoma of the rectum which gave no history of any previous trouble suddenly become ill with a severe symptom-complex of ileus, which, upon operation, proved to be a carcinoma of the rectum high up, with an almost complete stenosis of the gut. It is well, therefore, to keep in mind such a possibility in patients of the carcinoma age who show symptoms of an acute ileus. The next variety of pain to be described is the—

2. Burning or gnawing pain.—The mild form of this is known by the laity as "heartburn." The reason why this pain should be burning in character can be easily understood, if we remember that a raw surface exists over which passes the acid and mechanically irritating food contained in the stomach. This is the pain of gastric or duodenal ulcer or erosion, and a similar pain exists in ulcer or irritating disease of the urinary bladder, which is due to the same chemical and mechanical causes. A similar pain occurs in carcinoma having a large ulcerating surface.

When a patient complains of heartburn, one should guard against error, since many affections of the gallbladder, liver, pancreas, and intestines, general enteroptosis, or chronic appendicitis, first manifest themselves by a supposed gastric disturbance. It is easily seen why this should be the case when it is remembered that the stomach as well as other viscera is innervated by the vagus and sympathetic nerves. It is also of importance to recollect that the solar plexus, which acts as a central station for the nerves of this region, is in the immediate vicinity of the stomach.

It is particularly in this class of cases that a careful and detailed history is of value. In all such cases minute inquiry should be made as to the duration and course, relation to eating, sequence of symptoms, and other findings as pointed out in this paper. It may be taken as a fairly common fact that a very severe burning or gnawing

pain which is at all persistent is usually caused by ulceration or erosion of the mucous membrane of the stomach or duodenum.

3. THROBBING, ACHING PAIN.—This form usually accompanies inflammation, especially when its products are circumscribed, as by adhesions or abcess wall. This type is usually made worse upon movement of the body or tension of the abdominal wall, as, for instance, lying in the supine position with the thighs extended. This type of pain may be caused by an appendiceal or tubal abscess, etc.

When the products of infection are not circumscribed, then the pain is more diffuse and sharp, and the discomfort upon motion is even more marked. This is the variety found in diffuse peritonitis. In pancreatitis there is usually a great deal of peritoneal irritation and fat necrosis, and consequently this type of pain is usually present. In considering pancreatitis, although the symptoms of shock, the pallor, and small pulse are all characteristic, yet the condition should not be ruled out, as mild involvement of the organ may give the severe pain without the symptoms of shock being very marked. In passing it may be remarked that in this diffuse, sharp pain, described under general infection of the peritoneum, the toxic and nervous symptoms accompanying such a generalized process are usually also present.

In this connection it is well to recollect three rather commonly overlooked causes of acute pain. While not of the above variety, the pain arising from these causes will be discussed here simply as a matter of convenience. The diseases referred to are a pleuritic involvement with referred pain in the abdomen, angina abdominis, and the gastric crises of tabes dorsalis. It is notoriously common for the latter lesion to first manifest itself as a gastric crisis, at least the patient will seek the advice of the physician for relief of symptoms referred to this region in many cases before other symptoms come to the notice of its victim. If in cases that are not very clear a Wassermann is taken and the knee-jerk and pupillary reflex tried, many an embarrassing and incorrect diagnosis may be averted.

Other causes of similar pain are incomplete or unrecognized abdominal or inguinal hernias, arteriosclerosis of the abdominal aorta, and venous congestion of the liver either from cardiac disease or other causes. Neuralgic pains of the abdomen are relieved by deep pressure, while pain caused by a more organic disease is greatly increased by such manipulation.

4. VAGUE, DULL, INDEFINITE PAINS.—These are the bane of the patient and physician. In this instance it is well to remember Cohnheim's axiom as mentioned previously. It is here also that a most painstaking and minute history must be taken if even an approach to a correct diagnosis is to be made, and it can not be emphasized too

strongly that aside from the symptom of pain itself the accompanying findings must be carefully weighed, both individually and as a whole. If the functional factor can be ruled out, one or more of such hronic conditions as an old appendicitis, pancreatitis, cholecystitis, ecum mobile, marked atonic enteroptosis, incomplete obstruction f the intestines by bands, adhesions, or kinks, syphilis of the liver, nd the various diseases of the female pelvis are usually present. There are numerous other causes, but a few of the more common nes are mentioned simply to form an idea of what is meant. When patient complains of this type of pain, which is almost constantly resent and nagging in nature, it is not too much to spend from 30 inutes to an hour on the history alone. After the classification of he pain as to its character, the following points should be scertained.

LOCATION AND EXTENT OF THE PAIN.

The areas of subdivision of the anterior, lateral, and posterior abominal walls are well known and will not be discussed here.

The size or area of the pain is important in that certain lesions give ainful areas of characteristic extent, the following diseases serving s examples. The painful area of gastric or duodenal ulcer is very mited, being about the size of a silver dollar. Pain arising from e colon extends across the upper abdomen in a transverse direction, hile that arising from the small intestine manifests itself as a iffuse pain in the greater portion, but more especially in the central art of the abdomen. This rule is subject to frequent variation, deending upon peritoneal involvement and the nervous make-up of e individual. A rather simple plan to determine the location of e painful area is to ask the patient to place his hand or finger over e area and to outline it. The readiness with which a patient perrms this may furnish a clue as to the probable cause of the trouble. f the lesion is organic the patient will perform this in a definite and ecisive manner. Not so readily will a person with pain arising om an inorganic source point out the seat of his trouble. He will, the contrary, hesitate and place his hand in a shifting manner, d be very uncertain in his demonstration.

A very important feature of an organic pain is the constancy f the location as compared to the shifting area arising from a funconal lesion, and it is well to inquire carefully concerning this point. he change in severity of the pain upon the assumption of different stures, such as the prone, supine, and lateral positions, is also of nsiderable importance. The radiation of the symptom may often rnish much valuable information, as for instance in lesions of the allbladder or kidney and in gastric ulcer.

THE COURSE OF THE PAIN.

Much valuable information may be gained by the determination of these characteristics. In considering this point, the entire course should be kept in mind, namely, the onset, course, resolution, duration of the attack, periodicity of the attack, and any other aspect that may be peculiar in the case. As an example of the pain with a very sudden onset the colic of gallstones may be mentioned. Then the very severe course and rather abrupt resolution, with the following soreness over the region, the latter being a result of the irritation produced in the duct, is a characteristic syndrone. Another example is the pain of gastric ulcer, beginning as a mild "heartburn" and in from a few minutes to half an hour becoming a severe burning pain and often subsiding as a "heartburn" again.

When the underlying pathology is considered, one can easily follow in many of the diseases the pathological change of the tissues by the symptoms they produce. If after carefully weighing the various common conditions in which the pain described by the patient may be present and none of these seem probable, then and then only is one justified in looking toward the uncommon causes. The unrecognized causes of abdominal pain are gradually becoming fewer every day, and the simpler the diagnosis the more frequently will it be correct.

As an example of the close relation existing between the symptoms and pathology of a given condition, let us consider gallstone colic. The initial sudden, severe pain is just such as would be expected to be caused by a foreign body suddenly blocking the channel. The severe colicky pain that follows is caused by the presence of the stone and the efforts of the duct to rid itself of it; while the rather abrupt cessation may be explained by the stone either falling back or being extruded. As before stated, the following soreness which ensues is a result of the injury done to the organ. Many of the more common lesions can be analyzed in the same way, and if the physician will take the trouble in each case, he will be surprised at the number of cases that will be as easily explained.

EFFECT OF FOOD, VOMITING, DEFECATION, ETC.

The effect of food, vomiting, alkalies, etc., in typical cases of ulcer or erosion is well known. It is well to emphasize the fact that the resulting relief is constant as to time, degree, and permanency. In other words, in ulcer or erosion the same results will follow the employment of the same measures for relief.

In epigastric pain arising as a result of lesions of viscera other than the stomach or duodenum, relief may sometimes follow, but it

is not constant, and the degree of relief varies within wide limits. Thus, although some relief of the gastric symptoms in a chronic appendix or gallbladder lesion may occur, the striking uniformity of time and the other mentioned characteristics are vague or absent. Thus the relief may be marked at one time, transient at another; the vomiting may relieve the pain during one attack and perhaps increase it during another.

It is almost superfluous to mention the fact that change in the severity of the pain, or pain attended by the function of defecation, points to a lesion of the lower bowel or rectum. In differentiating lesions of the colon from those of the stomach, the determination of this feature is important, especially when the accompanying symptoms are not clear-cut and doubt exists whether the pain is of colonic or gastric origin.

In the pain of tabes, slight or superficial pressure causes severe agony, while deep pressure affords relief. I have known a tabetic patient to wear a very tightly-laced corset for the relief of this condition, while if his skin was touched slightly it would cause him most excruciating pain.

If modification of pain does not occur with the above-mentioned factors, then such diseases as syphilis of the liver, Pott's disease, tabes, pancreatitis, peritonitis, or involvement of the pelvic organs are very probable. In this connection it is well to remember that an abrupt cessation of a severe acute pain occurring in appendicitis must always bring the specter of gangrene before the mind of the surgeon.

THE SEQUENCE OF THE SYMPTOM-COMPLEX.

The consideration of pain as to time relation with other symptoms is of great value. The sequence syndrome of appendicitis and gallstones may be mentioned as examples. When the underlying pathology is considered it may be seen that only such a succession of symptoms in the order named could possibly occur, especially in uncomplicated cases. In acute appendicitis the well-known time syndrome of pain, nausea, vomiting, tenderness, and fever is present in the majority of cases. In fact, many authorities refrain from making a positive diagnosis of acute appendicitis in the absence of this sequence. In stone of the gallbladder or cystic duct, the severe shock, colicky pain, and catch in breath at the onset without jaundice occurs; while in obstruction or stone of the common duct, jaundice does occur.

RÉSUMÉ.

1. In diseases of the abdomen, the history is often of greater importance than the physical examination.

2. Consideration of the nature, and other features as mentioned, after a careful and minute history, may often furnish a correct diagnosis, when it would be impossible to arrive at one by other means, as the symptomatology is very closely dependent upon the causative pathology.

3. A careful consideration of the features of abdominal pain should include—

(*a*) Nature or character of the pain.

(*b*) Location and extent.

(*c*) Course of the pain.

(*d*) Effect of food, vomiting, defecation, alkalis, etc.

(*e*) Time sequence of the pain and the accompanying symptoms.

(*f*) Constancy of the features mentioned above.

4. After a careful history has been taken, then, and then only, should a physical examination be made. If this be done conscientiously the physical examination will have more of a corroborating than a determining nature in its bearing on the final conclusion.

DOSAGE IN ROENTGENOTHERAPY.

By A. SOILAND, Assistant Surgeon, Medical Reserve Corps, United States Navy.

In looking over 15 years' personal work with the roentgen-rays, a considerable part of which has been devoted to the treatment of breast conditions, certain facts have made themselves apparent, and it may not be amiss to discuss these in detail.

In the winter of 1901 I presented to the Los Angeles County Medical Society my first case of recurrent carcinoma of the female breast successfully healed by X-ray exposures (reported in Southern California Practitioner, April, 1902). At this early period of roentgen therapy much adverse criticism and direct opposition had to be met and overcome, and even at the present time it is quite infrequent that intelligent cooperation is had from the average practitioner in this line of work.

A great number of patients have come for treatment only with the appearance of secondary or even tertiary recurrences and at a stage so late that the most enthusiastic roentgenologist would hesitate to offer the slightest encouragement or even to consider treatment at all. Yet in some of these hopelessly advanced cases consistent treatment has been of sufficient value to rob the disease of some of its most distressing symptoms.

In the comparatively fewer instances when an opportunity is had to saturate the operative field with X-rays or where postoperative exposures are immediately instituted there can be absolutely no ques-

tion that the tendency to recurrence has been markedly diminished if not entirely eradicated.

In 1904 in another communication upon this subject (Southern California Practitioner, July, 1904) I asked the surgeon that whenever possible he permit his patient to have a number of preoperative exposures and if this were not granted, or found inexpedient, at least to institute postoperative exposures immediately. While all cases tendered this service can not be guaranteed freedom from subsequent recurrence, and despite the fact that several cases have had, to my own knowledge, recurrences, yet I am morally certain from close observation that a goodly number of patients thus treated have been rendered immune to further attack. The nature of this immunity is perhaps as difficult of comprehension as it is to know the causative factor in the first line of primary cell dissemination or malignancy. In all events the ray hardly acts as a direct generator of antibodies, but more than likely enacts the rôle of a fibrogenetic, and indirectly inhibits perverse cell proliferation.

Up to the present the net results of cancer investigation by commissions the world over have been inconclusive, at least in so far as a remedy is concerned, and surgery plus an efficient roentgen supplementary treatment is to-day our best weapon against this intractable disease. Radium and its derivatives are in my opinion of secondary import only and do not measure up in efficiency with quantitive X-rays, particularly in extensive involvement. Owing to the fact that scientific X-ray work is now available in all parts of the world there can no longer be any excuse for denying the cancer-suffering patient the benefits of this treatment, and I most strongly urge upon all who are not familiar with the technic or who are skeptical, to look into the reports bearing upon this subject.

Now as to X-ray dosage. Of late years there has come into being a group of workers who are strong advocates of massive doses, using powerful generating apparatus, and delivering to the deep structures an appreciable amount of active rays. This is accomplished by means of ray filters and segregated skin areas, so-called "cross firing," and is perhaps our most efficient method of application. This of course entails a thorough knowledge of ray measurements and depends for its accuracy upon one's ability to read correctly the color changes which occur in the ray-sensitive pastils provided for this purpose. A great number of operators, however, rely upon the electrical measurements of tube milliamperes plus spark-gap resistance. This I personally prefer, although it does not measure the amount of X-ray energy direct, yet forms a safe standard by which to gage the potential energy, or the sum total of the forces which regulate qualitatively the X-ray inductance. An accurate working exposure

formula can be tabulated by this method alone or in conjunction with any of the reliable radiometers.

It has been claimed that standardization of dosage and correct technic have eliminated so-called X-ray idiosyncrasies. This is highly erroneous, for no medicinal agent of any description has such diverse effect on the human skin as the X-ray. There are many beings upon whom a normal erythema dose will produce a most alarming reaction, and I have even seen a second-degree dermatitis follow a scant half erythema or pastil dose. It is wholly immaterial what the make, size, type, or cost of the generating apparatus may be; all standard instruments are capable of good work.

The one essential factor is to strike a proper balance between the exciting apparatus used and the particular tube in service. Then, all things being equal, the ensuing results depend upon the man behind the gun.

In seeing the work of eminent roentgenologists both in this country and abroad, I have often been struck by the apparent indifference displayed by some of them to the amount of X-rays employed at a given seance. In one clinic particularly, it was stated that 30-pastil doses were given at a single sitting, and through comparatively few filtered areas, and that they occasionally employed 50 doses. From this it is evident that there must exist a great variance in computing dosage, for I am certain that if an amount of this magnitude were employed in my laboratory, according to our dose table, irreparable damage would ensue.

In our work, when skin involvement is considerable, we use unfiltered rays to the point of skin tolerance. In deep work, and to lower skin resistance, a piece of gauze, soaked in normal salt solution, is placed over the area treated. The usual aluminum filters are employed and the skin areas segregated to the points of best advantage. When we obtain the surgeon's consent in breast cases a week's preoperative course is given. The entire chest and back are exposed, picking out a given section daily. There has been no deleterious effect upon operative wound healing. In fact it rather hastens union.

So soon as the wound has closed the regular postoperative course is applied. It is advisable to give the patient several prophylactic courses during the first two years following operation, then an occasional course for two years more. This applies only to those in whom no suspicious signs appear. In the cases of inoperable recurrences we are, of course, compelled to push the treatment to the point of tolerance with the conviction that we are employing the best means possible at our command, and to hope that the near future will supply us with a more potent agent that will successfully combat this ever-increasing and distressful disease of modern civilization.

NOTES ON THE PHYSICAL EXAMINATION OF 1,880 APPLICANTS FOR ENLISTMENT IN THE NAVY.

By C. H. LOWELL, Acting Assistant Surgeon, United States Navy.

The records of these examinations are kept on cards, 4 by 5 inches, on one side of which is the outline figure and chart for the teeth, and on the other side the headings for the necessary data. Notes of slight defects requiring entry in the health records are made on the margins of the outline figure side; also notes of disqualifying defects. It has been necessary occasionally to duplicate the medical officer's part of an entire set of enlistment papers from these cards, the finger prints only being lacking.

Of the 1,880 applicants examined 835 were accepted, 701 first enlistments and 134 previous service; 1,045 were rejected, and of these waivers were granted for 115.

Of all these applicants 484 had one defect of some kind, 519 had two defects, 393 had three defects, 217 had four defects, 86 had five defects, 37 had six defects, and 8 had over six defects.

Vision was 20/20 in 973. Vision was below 15/20, the minimum allowed in the Navy, in 161. This gives 746 with vision ranging from 15/20 to 19/20, inclusive. Strabismus convergent and divergent noted in 14. Pterygium in 15, ranging from the cornea-sclerotic margin to projection over the pupillary area sufficient to interfere with vision to some extent.

Defective hearing was found in 20 and otitis media in 30. It would seem desirable to have cases of otitis media operated on in preference to allowing them to go on for years, suppurating at intervals or the greater part of the time.

Underweight was found in 124 and underheight in 35. Deficient chest measurement in 18, deficient chest development and poor physique in 62, and deformity of the chest in 22. Tendency to or predisposition to tuberculosis in 13; but many of the cases of deficient chest development, poor physique, and deformity of the chest may well be considered as predisposed to tuberculosis. A good many of the minors whose height and weight do not closely correspond with the tables given in the Manual for the Medical Department do not have sufficient chest development to warrant acceptance. While every effort is made to eliminate tuberculosis, it is a difficult matter, and unless the applicants are well muscled and well nourished, it is unsafe to accept them. It seems to be quite generally agreed that most persons have some tubercular deposits in them, and in view of the article by Medical Inspector G. H. Barber, United States Navy, in the NAVAL MEDICAL BULLETIN for January, 1916, medical officers at recruiting stations must redouble their efforts to eliminate applicants predisposed to tuberculosis.

Defective teeth were noted in 68; this means below the minimum allowed for the Navy, that is, at least 20 sound teeth, of which there must be 4 opposing molars and 4 opposing incisors. If all cases of defective teeth were given, the number would be very large. Pyorrhea in some degree was noted in 313; it appears first on the external surfaces of the lower incisors. Much educational work is still needed before the doctrine of sound, well cared for teeth is universally accepted and carried out.

Eczema occurred in 11; psoriasis in 2; acne in 136; and other skin diseases in 16. Acne is a difficult disease to cure largely because it is hard to induce those afflicted to carry out the detailed treatment. Some excellent results are obtained with vaccines, but treatment usually has to be continued for many months to effect a cure.

Enlarged inguinal glands were noted in 236. This condition is usually slight and the cause is uncertain. Systematic Wassermann tests would be interesting but are not practicable at the present time at recruiting stations.

Enlarged tonsils were found in 359; of these, 37 very large, 164 medium enlarged, and 158 slightly enlarged. I find that a good many applicants are willing to have their tonsils removed, and complete enucleation is always requested. Only those with but slightly enlarged tonsils are accepted without operation prior to enlistment, and this means in many cases where only small stumps of tonsils remain.

Varicocele was noted in 296; of these 48 being large, 116 medium, 74 small, and 58 very small. Some applicants are willing to have an operation performed in order to enlist, but it is necessary for them to wait about six to eight weeks for the swelling to subside sufficiently to determine the success of the operation. Hydrocele was noted in 17.

Hernia, inguinal indirect complete, was found in 11; incomplete in 13; "tendency to" in 38. Hernia direct, complete, and incomplete, in 3; "tendency to" in 8. Relaxed inguinal rings in 274. A few applicants have had hernia operated on in order to enlist, but many do not on account of having to wait at least six to eight weeks after operation before final acceptance.

Feet very flat occurred in 160; medium flat in 68; slightly flat in 65; arches depressed in 335. Measurements of the arches are not given because they were not made in the earlier examinations. This subject I hope to take up at a later date. Men who walk or stand constantly on concrete floors and pavements appear to develop flat feet more rapidly than others. Poor shoes are a contributing factor and, especially, neglect to keep shoes in good repair. Wearing shoes that are worn badly on the sole and heel throws the weight of the body out of line and tends to produce flat feet with more or less tendency to talipes valgus. Knock-knees also tend to produce the

same condition. Applicants with very long, narrow feet sometimes show arch measurements of seven-eighths inch, with but little or no depression.

Varicose veins of the legs were recorded in 14; hemorrhoids in 34. Varicose veins of the legs appear to be poor risks, as it is very difficult to forecast the likelihood of their giving trouble after enlistment.

Lateral curvature of the spine was noted in 325. In a majority of these the curve is from one-fourth to one-half inch and appears to be principally postural. This has been shown in some who have taken systematic physical exercises for two or three months and then submitted to another examination. The method of determining lateral curvature of the spine is by dotting the spines of the vertebræ and using a plumb line, as given by Dr. Robert W. Lovett in his Lateral Curvature of the Spine and Round Shoulders, second edition.

Deficient mentality was recorded in 14. This does not represent the entire number applying, as some are rejected before coming to the medical officer and because in some cases other reasons are given as the cause for rejection. It would require a good deal of analysis to determine the approximate mental condition of each applicant, and while the excellent work of Acting Asst. Surg. A. R. Schier, United States Navy, and others has been followed, these tests have not been applied systematically at this station. The plan of Medical Director James D. Gatewood, United States Navy, in his Naval Hygiene, of having an expert do this work at training stations appeals to me as the best solution of this problem.

It has been found that the relatives of applicants who are desirous of having the person enlisted are prone to forget some important features of the applicant's history, and if opposed to the enlistment will make the applicant out as an almost hopeless case of deficient mentality. Better results are obtained by correspondence, as relatives are more careful when making written statements.

Generally speaking, the physical examination of a large number of applicants for enlistment, principally between the ages of 17 and 25, shows that we must advocate much more physical training in schools. While competitive athletics are good, they are for the few, and lead to athletic specialists. What we most desire is to have all young men go out in life well equipped physically, regardless of whether they enter the Navy or not.

The new method of physical training inaugurated by Surg. J. A. Murphy, United States Navy, and published in the NAVAL MEDICAL BULLETIN, July, 1914, is accomplishing wonderful results in the Navy. It is remarkable to note the differences in the men who come back on

leave just prior to completing their six months' training. While the same method is not adapted for use in the schools, some system could be devised, and, if made obligatory for at least 30 minutes daily, would produce excellent results. The widest publicity should be given Surg. Murphy's system and the results obtained.

C. B. Selden, hospital apprentice, first class, United States Navy, has rendered valuable assistance in the preparation of the notes for this article.

THE PRACTICABILITY OR DESIRABILITY OF OMITTING FROM THE SUPPLY TABLE CERTAIN DRUGS.

By J. A. Ortolan, Hospital Steward, United States Navy.

This article is intended to suggest the practicability of omitting from the supply table and from requisitions submitted from ships, stations, and hospitals in the Tropics for certain drugs and preparations listed on Form B.

There are 150 drugs and preparations listed on Form B, and of this number about four are of little or no medicinal value when received from the supply depot. This is not due, in a certain degree, to any fault of the manufacturer or of the keeping of these medicines at the supply depots but rather conditions of climate and age over which we can exercise very little or no control.

As noted above, this list is intended to include only such drugs and preparations as are unstable or are accepted as having practically no medicinal value when received from the supply depot.

Spiritus etheris compositus.—This preparation, commonly known as Hoffmann's anodyne, is prepared from ether, alcohol, and ethereal oil. This ethereal oil, prepared by distillation of alcohol, sulphuric acid, distilled water, and ether, is practically unobtainable in the market, usually replaced by a mixture of oils obtained as a by-product in the distillation of alcohol. This compound spirit of ether is, at best, variable in composition, does not comply with the pharmacopeial requirements, has no evident advantages over spirit of ether, U. S. P., and at times may be objectionable. It is suggested, if deemed necessary, that the simple spirit of ether replace the compound spirit of ether. The former preparation may be easily prepared on or at any ship, station, or hospital.

Spiritus etheris nitrosi.—The Pharmacopeia defines this preparation as an "alcoholic solution of ethyl nitrite ($C_2H_5NO_2$) yielding when freshly prepared not less than 4 per cent of ethyl nitrite."

This preparation, when freshly prepared, or even after being kept for some time with but little exposure to light and air, is neutral to litmus paper. When long kept, or after having been freely exposed to air and light, it acquires an acid reaction.

In order to overcome this defect and at the same time insure hav-g a freshly prepared solution of ethyl nitrite of pharmacopeial ·*ength* and requirements, freshly prepared when wanted, it is sug-*sted* that ampules of nitrous ether be supplied in place of spiritus *ıeris* nitrosi, these ampules to contain the required amount of *rous* ether, so that when the contents of one or more ampules, de-*ıding* on the amount of finished product desired, are allowed to *v* in sufficient quantity of ethyl alcohol the finished product will *form to* all requirements and tests of the U. S. P. This would l to eliminate waste, as at present spiritus etheris nitrosi after *ıg kept* for some time is unfit for use and is practically worthless *icinally* in this condition. This in itself would be a great saving *at the* same time insure a preparation of proper strength.

›veral samples from different shipments have been assayed by the *er after* being kept for several months and have failed to show :equired 4 per cent of ethyl nitrite. This preparation is exten-*y used* alone and in combination with other drugs. It enters in 'ery well-known and used remedy, mistura copaibæ compositus, ›ther modifications of this mixture of the national formulary.

ɪᴍᴏɴɪɪ ᴄᴀʀʙᴏɴᴀs.—According to the Pharmacopeia this should in not less than 97 per cent of a mixed acid ammonium carbo- (NH_4OCOOH) and ammonium carbamate (NH_4OCONH_2), hould yield not less than 31.58 per cent of ammonia gas (NH_3). lispensing purposes only translucent portions should be used. s salt when received from the supply depot usually has lost ımmonia (NH_3) and carbon dioxid (CO_2), is usually opaque, uite frequently converted into a white powder, probably am-m bicarbonate. As this condition is practically unavoidable, ıggested in view of its being but little used in the Navy, that ılt be omitted from Form B. For most requirements am-n chlorid, U. S. P., would answer practically the same purpose, ch as the ammonium carbonate as at present received is ıt in the above-mentioned requirements.

ı ʜʏᴅʀᴏɢᴇɴɪɪ ᴅɪᴏxɪᴅɪ.—A slightly acid, aqueous solution of :n dioxid (H_2O_2) which should contain, according to the States Pharmacopeia, when freshly prepared, about 3 per weight, of absolute hydrogen dioxid, corresponding to about nes of available oxygen. This solution as furnished ships, and hospitals, is usually preserved (?) with three-sixteenths ' acetanilid to the ounce. Acetanilid has failed, so far as the are concerned, "to preserve and add to the antiseptic quali-this solution.

the stopper is removed from a bottle containing hydrogen s supplied to ships, stations, and hospitals in and near ics, a heavy pressure is observed, due to the decomposition

of the hydrogen dioxid with the liberation of oxygen, leaving in the bottle water and a small amount of acetanilid, if the same was added at the time of manufacture. This occurs in a temperate climate, but to a lesser degree.

It is practically impossible to remedy this condition, although several manufacturers have repeatedly placed on the market different style bottles and stoppers with the object in view of trying to prevent as far as possible deterioration of the solution. One well-known pharmaceutical house placed on the market a solution of hydrogen dioxid, the bottles of which had stoppers having perforations through the center of the corks to retard deterioration. This perforation of the cork was partly closed by placing a quill in the center of the cork to prevent the contents from spilling. The object of this procedure was to try and make deterioration and evaporation of the solution about equal. Nevertheless the hydrogen dioxid is liable to deterioration upon keeping or protracted agitation. In cooler climates, when hydrogen dioxid is received, if the stopper be replaced with a pledget of cotton, deterioration may be retarded; this is almost impracticable on board sea-going vessels.

The writer assayed solutions of hydrogen dioxid as received from supply depots and not one sample was found to conform with the United States Pharmacopeia requirements as to strength, namely 3 per cent by weight of absolute hydrogen dioxid, corresponding to 10 volumes of available oxygen, that is that each c.c. upon decomposition failed to yield 10 c.c. of available oxygen.

It is suggested that a package containing the necessary chemicals and reagents replace the solution of hydrogen dioxid on the supply table, so that this article may be prepared when wanted on board ships, and at stations and hospitals. This would insure the medical officer receiving a product of some value, conforming to all the requirements of the United States Pharmacopeia.

CONCLUSION.

The object of pharmacy is to exercise control over the identity and purity of articles used as medicine, and while it is generally admitted that the average hospital steward can not well be expected to systematically examine all of the articles (medicines) on the supply table, owing to the limited laboratory facilities on board ships, there is no reason why he should not concentrate his efforts, in conjunction with the pharmacist at hospitals, where facilities are available, on the limited number of articles (medicines) included in Form B, of useful drugs, so as to insure to medical officers and others that the article included on the supply table will uniformly comply with the official requirements of the United States Pharmacopeia.

UNITED STATES NAVAL MEDICAL SCHOOL LABORATORIES.

Additions to the pathological collection, United States Naval Medical School, April–June, 1916.

Accession No.	Tissue.	Diagnosis.	Collected by or received from.
1147	Lip..............	Papilloma..................	Surg. R. Spear.
1148	Sac inguinal hernia	Inguinal hernia............	Passed Asst. Surg. L. W. McGuire.
1149	Tongue...........	Carcinoma..................	Surg. A. M. Fauntleroy.
1150	Kidney and pancreas.	Acute poisoning by mercury.	Medical Director G. Pickrell.
1151	Lung.............	Hemorrhagic infarct with organization.	Medical Director J. G. Field.
1152	Kidney, liver, and spleen.	Arsenical poisoning.........	Surg. C. M. Oman.
1153	Various tissues....	Sarcoma....................	Passed Asst. Surg. C. W. O. Bunker.
1154	Liver, kidney.....	Syphilis....................	U. S. S. Solace.
1155	Superior maxilla..	Epulis......................	Surg. R. Spear.
1156	Thigh............	Fibroma....................	Naval Hospital, Philadelphia, Pa.
1157	Ovary............	Cystoma....................	Surg. R. Spear.
1158	Uterus...........	Fibroid.....................	Do.
1159	Intestine.........	Meckel's diverticulum......	Surg. A. M. Fauntleroy.
1160	.....do...........	Intussusception............	Do.
1161	Nasal smears.....	Leprosy.....................	Asst. Surg. C. R. Baker.

Additions to the helminthological collection, United States Naval Medical School, April-June, 1916.

Accession No.	Parasite.	Host.	Collected by or received from.
19924	Ova of intestinal parasites...	Homo.............	Surg. R. Spear.

Description of dressing.—The dressing as used on the *Nebraska* is essentially a large sponge pad of cotton covered with gauze, with a four-tailed muslin bandage secured to it. The "splints" are not incorporated with the pad for the following reasons. The chances are that the majority of wounds will need a large pad with firm pressure first, and this is not so easily accomplished by a stiff dressing. If, after placing on the pad, a "splint" is needed, it can be easily incorporated in or secured on the outside of the pad by the many-tailed bandage. These dressings occupy such a small space that this is a great advantage, they being easily packed in the first-aid bags of the guns' crews, and the splints, as described later, placed in the same bag. These pads are 12 to 15 inches long and 6 to 8 inches wide. The tailed muslin bandages secured on them are 5 or 6 inches wide. The cotton is the thickness of a large roll of cotton, this being folded in gauze. Two of these pads when completed are folded in a muslin cover, and after sterilization covered with oiled silk and then muslin to protect the oiled silk, forming a package 6 by 6 inches by about 2½ inches thick. The four-tailed roller was adopted on account of the ease of application, and to secure firm pressure on all parts of the pad, especially in head, neck, and shoulder injuries; also this arrangement lends itself more to "tying" on tightly and not so much bandaging, and it is found that the sailorman can "tie" on better than he can bandage, the latter seemingly sometimes to cause confusion. Oftentimes a man is told to "bandage" and he is at a loss to know what to do, whereas if he is told to "tie" the dressing on he goes ahead and puts the dressing on in some manner, generally securely and tightly, which is the real object of the bandaging.

The method of making these pads on board ship is as follows, with figures of the completed dressings and their applications:

Figure 1 (II) shows the package unfolded and gives an idea of what is desired. The pad is a square cut from a roll of cotton and folded into gauze so that none of the cut edges of the gauze and none of the cotton shows or can get loose. It is the "folded gauze sponge" of some of the hospitals, with cotton inside.

To insure stability, one or both sides of the sponge has a stitch in the center, this suture catching some of the cotton. At the two middle thirds the bandages are sewed in, these bandages being long enough to encircle the abdomen twice. The center of each bandage is sewed to the pad and then the ends of the bandage rolled in from each end and secured to each other by a safety pin.

These bandages are thus so secured that one of the double bandages can be applied and the other will remain in its place until unpinned. These rolled-up bandages also indicate the handles for the pad, which has been folded on itself once as shown in figure 1 (I), the part to be

Freeman—First-Aid Dressings.

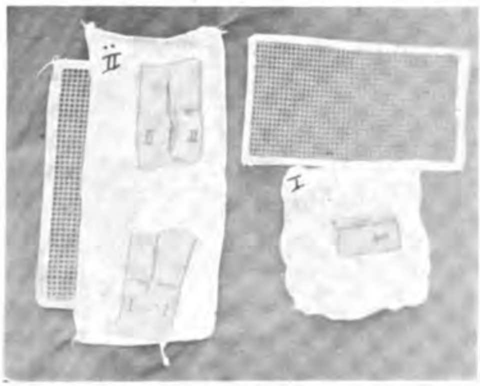


Fig. 1.

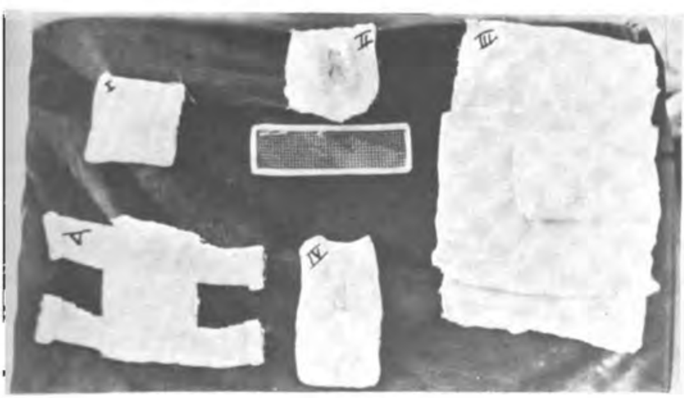


Fig. 2.

Freeman—First-Aid Dressings.

Fig. 3.

Fig. 4.

Fig. 5.

applied being inside, and as the person using the dressing takes hold of the bandages to unfold pad there is no chance of touching the side of pad which is to be kept sterile and which is to be applied to the wound. Figure 1 shows the pad unfolded; the double rollers are slightly separated to show construction, whereas in the packages they are approximated closely. This figure also shows the splint and the splint incorporated with the pad, enough being left out to show the method. Usually the splint is entirely covered by the upper or the outside layer of the gauze. The dressings are usually done up two in a package, sterilized, and then wrapped in oiled silk and muslin. One of the pads in a package makes a small convenient dressing, and at dressing stations four or six can be done up in one package. There is also kept at the dressing stations a reserve supply of splints.

Some practical points in making these packs are noted for use while instructing the Hospital Corps in making them. Take the cotton just as it unrolls from the large roll of cotton and cut the pad with large shears the desired size, using two thicknesses if an extra thick pad is desired. Cut off from the roll of meter-wide gauze a piece about three times as long as the cotton pad. Unfold and spread out this gauze, placing it so that selvage edges are parallel to the lines of folding. Place the cotton pad near the center of one of the selvage edges at a distance of one-half the width of the pad from the edge. Fold over and over until all is folded except an amount of gauze one-half to one width of the cotton pad. Turn the pad with the gauze over and fold the gauze ends over to the center of the pad, then turn the extra one-half or one width of the gauze back over the folded ends of gauze. On one side of the pad thus far completed there will be found a "pocket" of gauze, and all the folded edges on the other side; turn inside out and "square" by inserting fingers or shears or a pencil, and suture one of the long muslin bandages, not rolled up, fold at center, and attach this edge to the centers of the pad at one-third distances with thread and needle. In attaching bandage it is best to sew through the cotton pad as this gives extra firmness, but it requires patience and a sharp needle, and the pad will hold well if sewed through the gauze and some of the cotton. Roll the bandages from each end "in," so that in applying they will roll "out"; secure the double-rolled bandage with a safety pin which can also be used in the final application of dressing. Fold the pad on itself with bandages out as in figure 1. Do up in muslin, sterilize, wrap in sterile oiled silk or some impervious material, and cover this with muslin to protect the oiled silk. The oiled silk could be omitted but this would necessitate more frequent sterilization of the packages. In opening dressings take hold of the muslin bandages only.

In wrapping the pads in the muslin the most convenient size of muslin is that three times as long and wide as the pad. Put the pad in the center, fold over the sides, then the ends, and have the selvage edge of the muslin to pin at the end of the package, where ordinary pins can be easily inserted. The ordinary roll of muslin is too wide for these square wrappers, but the width needed can be estimated and the long extra strip torn off can be used for making the roller bandages. The oiled silk need not be as large as the muslin wrapper.

Should a dressing with the splint incorporated be desired, this same method of the four-tailed bandage can be used, making a dressing quickly applied; the tying of the bandage ends can effect any pressure required. Smaller dressings of medium size can be made on the same principle.

Figure 2 shows a series as found in process of opening the package: I is the package unopened; II shows one of the pads folded as it is found in the package; III shows the package opened with the two pads in a bundle and the wrappers, muslin, oiled silk, and muslin; IV is the pad unfolded; and V is the unfolded pad with the bandages unrolled about a foot to show their position. This figure shows the small size of the package unopened, and by comparing with the pad held in the hand of the assistant in figure 3, the relative size can be judged. The pads are rolled tightly in muslin, but of course can not be reduced to the small size that they could be made with a compression machine. The package, even as it is, has the advantage of comparative smallness and does not require any special apparatus in making, and can thus be made by the Hospital Corps in the sick bay.

The splint is the usual wire splint with plaster around the edges. They can be made of any size desired, those used on board the *Nebraska* being of such a size that they will fit the first-aid bags. This splint, or any that is incorporated with a dressing, is more to assure fixation of the dressing on the wound than to act as a real splint, and in case of the fracture of large bones a large real splint would have to be used. However, three or four of these splints can be overlapped and can also be used double, so that a splint as long as necessary can be improvised from these.

Methods of application.—Figures 3 and 4 show some of the applications of these dressings. In extensive wounds and burns two of these pads can be combined. The applications to the head, neck, and shoulder show the especial advantages of the many tails. At the shoulder for instance, figure 4 (I), one of the bandages can go around the neck to the opposite side, or even over the face, or under the other shoulder (as shown here), and the other bandage can wind around the arm or deltoid region. For the head and neck, the band-

ages can tie around the forehead, face, and neck, as figure 3 (I), and can easily be applied to top of head by tying around neck and under chin.

For the chest and abdomen, figure 4 (II), the application is easy. The applications for arm and thigh are shown in figures 3 and 4. This same dressing will also apply easily to the hands and feet, and at the groin and buttocks is more efficient than any roller bandage. In figure 3 (IV) the application of the pad to chest is shown, the hands grasping the bandages as handles, and as the bandages will not unroll without being unpinned both hands can be used for the application of the upper bandage and then the lower one unpinned and applied. Also as the rollers are 6 inches wide and are long enough to encircle the chest twice, a firm swathe can be produced.

In practical work there has been no part of the body where the dressing could not be applied quickly and firmly, and as the wire splint is pliable it can be made into a "cap" for shoulder, head, elbow, etc.

First-aid pouch.—This should be of canvas, as shown in figure 5 (I), and should be plainly marked for the gun it is intended, this one being for No. 5 six-inch gun. It contains rubber tourniquets, splints, shell dressings, also medium and small first-aid dressings, and a muslin roller bandage. It is easily hung from hammock hook or in any convenient place. Another type is the "pouch," which has a flap and also end flaps for protection against rain, dust, etc., shown in figure 5 (II) and (III). This particular pouch is permanently in the "fighting tops." It can be carried or hung by the strap or can be secured to any railing or rope by the "tie-ties" on the back of the pouch shown in figure.

The bags for the tops are painted "war" color and the inside contents also covered with oilcloth or oiled silk. A permanent metal container might be better for the fighting tops, but the one described answers all purposes and has the advantages of being easily carried by strap over the shoulder or secured by the ties any place, and can be opened easily and the contents renewed.

The chief advantages of the dressing described are its compactness and the ease with which it can be applied to any part of the body. This package can also be made on board ship and can thus be renewed as necessary or be resterilized. It offers a definite type of shell dressing or large first-aid dressing.

First-aid on battleships.—If, as regulations require, there shall be emergency dressings on hand for 20 per cent of the crew, there should be on hand in the first-aid bags and in the dressing stations at least 120 of these dressings, besides the medium and small dressings. All of the above should be kept at the dressing stations, for they are not only available for battle but should be ready for any

emergency, as fire or gun explosion. From general observation it is deemed advisable that each ship should have a definite number of some shell dressing, the type being established by the Surgeon General or left to the medical officer of the ship; the definite number, however, should be established in its minimum. There are on the *Nebraska* 132 large dressings at the dressing stations and in the first-aid bags, in addition to the small and medium dressings, also extra large dressings for instruction and for daily emergencies.

Several medical officers have approved the particular type of shell dressing used on the *Nebraska*. As stated before, all first-aid dressings are built on the same principle, and nothing new can be claimed for this dressing; it is, however, a definite dressing and not merely some gauze pads and some bandages that are called "first-aid dressings."

As an aid to division officers and all officers on board, a copy of the following plan of dressing stations, etc., is given to all officers, especially just prior to target practice; in addition to a period of instruction to all officers in the first-aid bag:

1. Permanent first-aid pouches are kept in all turrets, torpedo rooms, fighting tops, and handling rooms, except the two waist turret handling rooms, which are distributed at general quarters; also a first-aid pouch is sent to bridge, and package to engine room and firerooms. There are also sent at general quarters first-aid bags to 6-inch guns and 3-inch guns as necessary. It is requested that these permanent pouches be kept intact except in accident or emergency.

2. It is obviously impossible for the Hospital Corps to go to all parts of the ship, as into turrets, in the fighting tops, bridge, etc., during actual engagement, and first-aid must be administered by comrades—see Ship and Gun Drills, 1914, par. 410. To this end, and also in case of accident, all gun's crews especially should be instructed in first-aid, a period of 20 minutes to 30 minutes being necessary, by medical officers.

3. Small first-aid dressings are distributed to division officers to expend in practice. These are the small packages with one bandage. The large "shell" dressings have two bandages and are applied in similar manner, as all first-aid packages are built on the same principle; a pad, and some kind of bandage to fix it, and also a wire splint, if necessary, as found in the bags on the *Nebraska*. Tourniquets, rubber, are best tied by simple square knot.

4. *Dressing stations.*—Main, forward, on starboard side C. P. O. quarters, with ladder to gun deck. Relief, in side passage, starboard side, near ladder to gun deck. This relief station is intended as a mobile party for 6-inch guns. Second dressing station, aft, on port side, in passage outside warrant officers' rooms. Second relief station, on port side, in the side passage.

5. The medical officers are available at any time for instruction in first-aid, in addition to any instruction by divisional officers.

6. First-aid packages will be supplied to any boat on application at the sick bay, and it is advisable that two or three of the small first-aid packages be kept in boats, especially boats going off for the day.

It is felt that a memo such as the above gives all officers on board a permanent reference of the general plan of dressing stations and

first-aid, the accurate knowledge of this first-aid plan sometimes not being known. During the very busy days of preparation for target practice the cooperation of all officers is necessary in order to have the new men on board ship receive even the first principles of these dressings, and as they have had no instruction at training stations some instruction on board ship is necessary. It is questioned whether it would not be expedient to have the apprentices at the training stations have at least one instruction in first-aid, so that when coming on board ship they would at least know what a first-aid dressing and tourniquet were. Many men are found who have never had any instruction in first-aid, which means that the entire crew has to be instructed to reach these few. It is granted that the entire crew should have instruction, but when a ship sails from a navy yard and practically immediately begins target practice it is almost impossible to get the divisions for instruction. It is for these reasons that memoranda such as quoted are most efficient. Also a definite type of dressing submitted by the medical officer is another essential for the success of this instruction.

CLINICAL NOTES.

THE LEWISOHN CITRATE METHOD OF BLOOD TRANSFUSION, WITH REPORT OF A CASE OF TRAUMATIC GLUTEAL ANEURISM IN WHICH THIS METHOD WAS EMPLOYED.

By R. B. WILLIAMS, Surgeon, United States Navy.

Of the modern methods of blood transfusion, the cannula method of Crile and the suture method of Carrel are open to the very serious objection that considerable technical skill and experience are required in their performance. The paraffined tube of Brewer greatly simplified the technical difficulties, as did the substitution of the vein-to-vein method for the artery-to-vein method in accomplishing the anastomosis. The use of a U-shaped tube, as suggested by Fauntleroy and others, further simplified the technic of transfusion. All these methods, however, are open to the objection that it is impossible accurately to estimate the amount of blood transfused, or even to determine positively, at times, that any blood at all is passing from the donor to the recipient. To overcome these objections, Lindemann revived and perfected the method of transfusion by the employment of a number of record syringes, and for a time this method became very popular. Kimpton and Brown and, more recently, Percy have recommended that large cylinders of 500 c. c. or more capacity and lined with paraffin be used in performing transfusions. Such cylinders are made to taper into a cannula of a suitable size for insertion into a vein. Such containers are filled with blood from the vein of the donor and the blood is immediately allowed to flow into the vein of the recipient, the success of the method depending upon the fact that the transfusion is done so quickly that the blood has not time to clot.

To overcome the various defects in the older methods of blood transfusion, Richard Lewisohn instituted a number of experiments in order to find a substance which would retard the coagulation of the blood for a sufficient period to permit of its easy manipulation and at the same time would be nontoxic and harmless in the amount required. After experimenting with hirudin, which was found alarmingly toxic in the required amounts, it was found that two-tenths per cent citrate of sodium in the blood would prevent its coagulation for a period of two days or longer, and that a sufficient amount of this substance to prevent the coagulation of 1,000 or 1,500 c. c. of blood

had no toxicity. The results of these experiments have apparently solved the problem of blood transfusion and will make this procedure one of great simplicity and safety.

The above facts are put into practice in performing transfusion in the following manner: Into a sterile graduate is placed an amount of 2 per cent solution of sodium citrate equaling one-tenth the amount of blood that it has been decided upon to use in the transfusion, and into this receptacle the blood of the donor is allowed to flow through a large needle or cannula inserted into an appropriate vein at the elbow. As the blood flows the solution is gently stirred with a glass rod until the amount of blood decided upon has been withdrawn. The citrated blood which shows no tendency to clot is now filtered through several thicknesses of sterile gauze and is then transferred to an ordinary saline transfusion apparatus and is allowed to flow into a vein of the patient through a cannula previously inserted in exactly the same manner as is done in an ordinary saline transfusion. Lewisohn recommends that one-half the amount of the citrate solution be first placed in the graduate and when one-half of the required blood has been withdrawn the remainder of the solution be added. It will be noticed as pointed out by Lewisohn that in using a 2 per cent standard citrate solution the calculation of the amount of solution required to obtain a two-tenths per cent solution is extremely easy, for it will be seen that one-tenth of the total amount of blood to be transfused is the amount of the citrate solution required. It is advisable to use a needle of large size in obtaining the blood as the rapidity of the flow tends to prevent coagulation until the blood is thoroughly mixed with the citrate solution.

We have had occasion to use this method three times within the past few months and have found it extremely simple, easy, and practicable. After considerable experience with the older methods, especially the Brewer tube, the ease and simplicity of the Lewisohn citrate method strikes one very forcibly. It is a method that can be used by practically any physician with any surgical experience, and it especially recommends itself when for any reason modern hospital facilities are not available. The method should strongly appeal to the military surgeon, for by its use in hospitals not too remote from the firing lines many wounded in desperate condition from hemorrhage may be saved.

TRAUMATIC GLUTEAL ANEURISM.

C—, ordinary seaman; aged 23 years. Admitted to the Naval Hospital, Norfolk, Va., August 27, 1915.

About three weeks before admission the patient fell while in a boat, bruising himself severely. He remembers distinctly that the

left gluteal region received the brunt of the fall. He had completely recovered from his injuries when three days before he was admitted, after sneezing, he felt something give way in his left buttock and in a very short time noticed that the part was swollen. The swelling increased and the pain became severe, so that on the second day after this accident he reported at the sick bay for treatment.

Under the belief that the condition was abscess, a vertical incision was made in the sacral region about 2 inches to the left of the midline, which was followed by a tremendous gush of blood; very free bleeding continued for some time until finally controlled by packing and pressure. A saline transfusion was given, and the next morning the patient was brought to the hospital.

On admission August 27, I found a thin, poorly developed man showing extreme pallor, restlessness, and nausea. Temperature 99°, pulse 130, small and thready, breathing rapid and labored. Vomited soon after admission.

He was taken at once to the operating room and a vein transfusion by means of Brewer's paraffined tube given. The blood was allowed to flow until the donor began to show slight signs of air hunger. At the conclusion of the transfusion the pulse was 108, color greatly improved, no dyspnea or restlessness. The wound and an enormous cavity were repacked with strips of gauze without inducing additional hemorrhage. Forceps could be introduced through the sacral wound to the depth of 8 inches or more.

September 8, 1915: Recovery uneventful up to this day, when three severe hemorrhages from the wound occurred between 5 p. m. and 1 p. m., bleeding finally controlled by packing and pressure.

September 9, 1915: Patient pale, anxious, and restless; pulse 122 before operation.

Preceding the operation 500 c. c. of blood were transfused by the citrate method. The line of incision was infiltrated with 2 per cent novocain, and under very light chloroform anesthesia the abdomen was opened through a paracentral incision below the umbilicus; with the patient in Trendelenburg position the left internal iliac artery was ligated after incising the peritoneum and clearing the vessel. The abdomen having been closed, the patient was turned over and the oblique incision for exposing the sciatic artery made. After enlarging the wound it was seen that the bleeding, which continued in spite of the ligation of the internal iliac, came from a vessel emerging above the pyriformis muscle, i. e., the gluteal artery. The bleeding point, which it was impossible clearly to expose, was ligated by means of an encircling ligature and the bleeding controlled. A huge cavity existed beneath the gluteal muscles.

The wound was partially closed and drains inserted. The patient having lost considerable blood, a second transfusion of 500 c. c. of citrated blood was done. On leaving the operating room the pulse was 160 per minute and of good volume.

From this time recovery was practically uneventful. The wound slowly closed by granulation. When last seen, November 1, 1915, the patient was up and about and rapidly regaining his strength.

REPORT OF A CASE OF LUDWIG'S ANGINA.

By W. A. BRAMS, Assistant Surgeon, United States Navy.

The following report of a case of Ludwig's angina is interesting from three viewpoints. These are:

1. The rare occurrence of a genuine case, and the great number of cases of swellings of the neck due to other causes, incorrectly diagnosed as true Ludwig's angina.
2. The characteristic features of this disease.
3. The thorough treatment at an early stage.
4. The chief dangers of this condition.

The patient, a ship's cook, reported in the sick bay on January 25, 1916, complaining of a swelling underneath the jaw on the right side. This swelling had been present for four days, and there was marked pain and dysphagia, and the mouth could not be opened without causing great discomfort. Salivation was profuse, slight soreness of the throat was present, and he had a sensation as though something were pressing upon his trachea.

Examination of the patient revealed the following findings: A hard, very painful, brawny swelling about the size of a fist just under the body of the lower jaw, extending downward to underneath the sternum and clavicle. There was no extension backward toward the angle or ramus of the jaw, and the lobe of the ear was not elevated. The mass was fixed, especially in a vertical direction, and no lobulated swelling such as is found in involvement of the cervical glands could be palpated. In other words, the process was limited to the cellular tissues of the neck, and not the glandular. The opposite side of the neck was uninvolved.

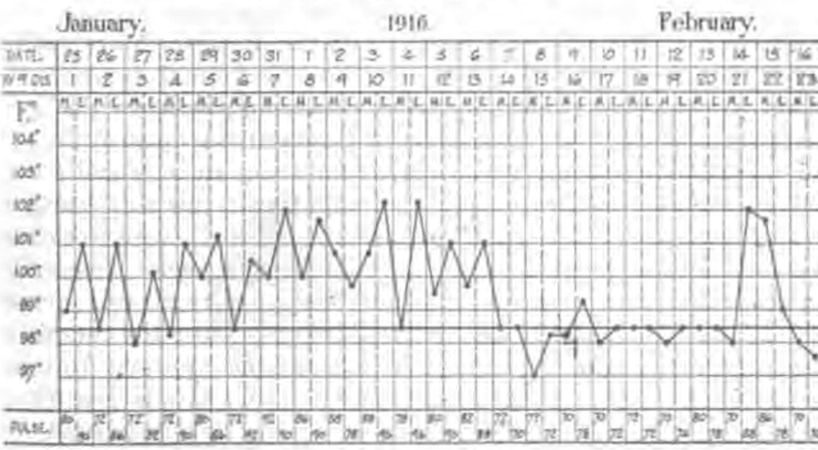
The right pupil was dilated but reacted to light and accommodation. The pharynx showed a slight hyperemia and the floor of the mouth was edematous, but no tonsillar infection or swelling could be discerned. All of the teeth were in normal condition and no focus of infection could be found.

The temperature on admission was 98.8 F., a septic facies was present, the white corpuscles numbered 25,400, mostly polymorphonuclears, the stained smear revealed no malaria, and further physical examination showed nothing of importance.

Before questioning the patient as to the origin and early course of he trouble, I requested him to write about these aspects of his case, o that no leading questions would be asked, and the following is a opy of his statement:

"On January 21, 1916, I noticed a small swelling underneath my aw, on the right side. On the 22d it seemed to have swollen a little ıore. On the 23d my throat started to trouble me and the swelling ontinued. On the 24th the swelling had increased and I could not wallow anything that was not in liquid form, as my throat was too ore." Attention is invited to the following significant points in this tatement:

1. The swelling under the jaw appeared before any symptoms in he throat or mouth did, for at least two days.



Ludwig's angina.

2. The swelling first appeared under the jaw.

3. The rapidly progressive course of the swelling; only when it eached a considerable size did the soreness of the throat and dys-hagia appear.

From the examination, the following points are of interest:

1. The rapidly progressing swelling of the cellular tissues, so that n four days it extended from the jaw to underneath the sternum.

2. The swelling was diffuse and showed no glandular involvement ıt all.

3. The extensive swelling involved the cervical ganglion in the right side of the neck, causing a paresis of the cervical sympathetic nerves supplying the muscles of the iris, with a consequent dilatation of the right pupil.

4. The absence of any apparent causative lesion in the mouth, pharynx, or teeth.

In the differential diagnosis, the following conditions were considered especially:

1. *Cervical adenitis.*—No enlarged glands were palpable on either side of the neck and, as remarked, the swelling was not "lobulated" but diffuse. Also no infectious focus in the vicinity of or in the mouth could be found.

2. *Mumps.*—The swelling was limited to the region under the jaw and did not pass posteriorly to the ramus, nor cause an elevation of the lobe of the ear. The high leukocyte count, over 25,000, in contradistinction to the leukopenia and relative increase of mononuclears as obtains in mumps. The subsequent appearance of pus, the distinctly septic course and temperature, and the absence of an epidemic of mumps practically ruled this condition out.

Treatment.—Immediate incision of the superficial tissues, with drainage, did not change the course of the disease. More radical measures were taken, as follows: A long horizontal incision was made over the most tender point, this being slightly below the lower margin of the submaxillary gland. A hemostat was pushed through the incised skin and superficial tissues for about an inch and a half. The instrument was then opened and withdrawn, this step being repeated in all four directions. Drains were inserted, large wet dressings applied, and both drains and dressings changed frequently. In passing, it may be added that the hemostats were pushed upward toward the mouth until the points reached just under the mucosa of the floor of the mouth. At no time did any pus appear. In using the hemostats, care was taken that the cervical fascia was penetrated. The importance of this step can be seen when it is remembered that the entire process was situated under this structure, and unless it was opened the entire treatment would be insufficient. The accompanying sketch is intended to illustrate the anatomical reason for the above statement.

Although no pus was liberated immediately on incision, and none appeared until the third day after the operation, the symptoms did not increase in severity and the swelling did not become larger. On the second day a thin sanious serum was found to exude, and this increased in amount until on February 6, 1916, pus made its first appearance. Examination of the secretions on the instruments, exuding serum, and the subsequent pus showed the absence of bacteria, being apparently sterile.

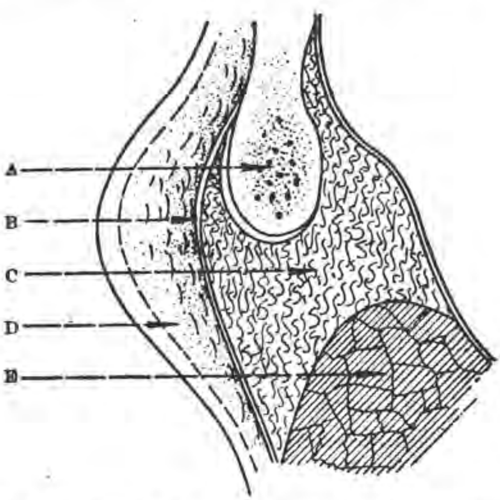
On the day that the sterile pus appeared and on the succeeding days improvement of the symptoms and degree of the swelling was constant. The temperature fell, the swelling subsided, and in about two weeks the patient was well. In passing it may be stated that if the incision and drainage are ample enough, even though no pus is

Three views showing the affected area just under the jaw and extending downward. The lobe of the ear on the affected side is not elevated to any extent.

"The liver was of huge size, extending almost to the brim of the pelvis on the right side. It was very soft and friable, had a mottled appearance, and was of a grayish-green color. The liver tissues had broken down in several places, and at the lower margin of the right lobe was a large broken-down area to which blood clots were adherent and from which fluid blood could be pressed. This portion showed a considerable erosion from which the hemorrhage had taken place. On section the liver showed numerous necrotic areas varying in size from that of a pea to that of an English walnut."

evacuated at the time, the treatment is not in vain. If no pus is found, but the swelling and symptoms are arrested definitely, then sufficient means have been taken. Should the symptoms not become better, or remain stationary immediately, then no treatment is too heroic. No time should be lost in making multiple deep incisions, all extending under the cervical fascia, and elaborate drainage instituted at once.

Statistics state that the mortality is from 30 to 50 per cent, the most frequent and dangerous complications being edema of the glottis, extension of the process down to the mediastinum, with which it is anatomically continuous, and death from sepsis. Should such complications arise, tracheotomy may have to be performed,



section through the body of the mandible. *A*, mandible; *B*, aponeurosis or cervical ia; *C*, infected area of cellular tissue surrounding the gland; *D*, edematous sub-neous tissue and skin; *E*, submaxillary gland.

the usual treatment for sepsis instituted, as saline transfusion, per rectum, stimulation, etc., in addition to the local treatment. *ology.*—Most frequently streptococcus, although pneumococcus, us of malignant edema, staphylococcus, etc., have been reported. ionally some focus is found in the mouth, such as ulceration, of a tooth, or undeveloped third molar. Where such a focus nd much doubt is entertained as to the genuineness of the case. undisputed case no such focus is found. The causative organ- thought to come from the mouth, travel by way of the lym- s to a small number of lymphatic glands around the sub- ary gland, and owing to the extreme virulence of the infec- use these to break down very quickly. The process then ex- rapidly to the surrounding cellular tissues and then spreads

down along the neck and into the mediastinum along anatomical lines. The picture that is usually seen is that stage where the swelling is limited to the region of the submaxillary gland, and the process is essentially an infection of the cellular tissues around the submaxillary gland, which tends to extend rapidly.

It is distinctive of Ludwig's angina that few or no cervical glands are involved and that the process is limited to those tissues under the cervical fascia.

Clinically the rapidly spreading swelling, the violent symptoms, and the later involvement of the pharynx with dysphagia and salivation and the stormy course of this rapidly fatal disease form the general picture of this serious condition.

Death is usually due to edema of the glottis, bronchopneumonia, or sepsis. However, prompt and thorough treatment will usually abate the condition until the body has formed sufficient antibodies, if not immediately rendering relief, and no treatment is too radical if the process does not react promptly to the means instituted to curb it.

RUPTURE OF LIVER. REPORT OF CASE.

By C. W. Depping, Assistant Surgeon, United States Navy.

The patient, a male Chamorro, age 55, was admitted to the hospital complaining of excruciating abdominal pain of sudden onset. He stated that he had not been feeling well for the past five weeks, and had also lost considerable weight. The abdomen was greatly distended and very rigid. It was tympanitic in the median line, but there was marked dullness in both flanks. The patient showed marked scleral jaundice. Abdominal organs could not be mapped out on account of rigidity and distention. He denied being a *tuba* drinker, and there was no history of trauma. Shortly after admission to the hospital he sank into a comatose condition resembling shock and died.

Necropsy showed a small, spare man who had evidently lost considerable weight. The abdomen was markedly distended and on opening was found to be filled with blood. All the tissues were deeply jaundiced. The liver was of huge size, extending almost to the brim of the pelvis on the right side. It was very soft and friable, had a mottled appearance, and was of a grayish-green color. The liver tissues had broken down in several places, and at the lower margin of the right lobe was a large broken-down area, to which blood clots were adherent and from which fluid blood could be pressed. This portion showed a considerable erosion from which the hemor-

rhage had taken place. On section the liver showed numerous necrotic areas, varying in size from that of a pea to that of an English walnut. The liver showed considerable fatty degeneration and there was very little normal liver tissue left. The spleen was slightly enlarged. The features of the case which are interesting are the sudden onset of an excruciating abdominal pain, marked distention, dullness in flanks, and the scleral jaundice.

SYPHILIS IN A CHAMORRO.

By L. W. JOHNSON, Passed Assistant Surgeon, United States Navy.

One of the postulates on which certain theories as to the nature of gangosa have been based is that the natives of Guam are immune to syphilis. For this reason alone I desire to place on record the following instance of its occurrence in a Chamorro:

An enlisted man of the U. S. S. *Supply* contracted a venereal sore and was transferred to this hospital with the diagnosis of syphilis. The exposure took place during a visit to Japan and he was transferred about six weeks later, on the return of the ship to Guam. The sore was a typical hard chancre involving the glans penis. There was also general glandular enlargement and a macular rash. The Wassermann reaction was strongly positive.

Salvarsan was administered intravenously and the symptoms rapidly disappeared. Mercury was given by inunction and by mouth. A later Wassermann reaction was negative.

The man was questioned carefully as to his family history. So far as he knew he was of pure Chamorro blood and none of his people had gangosa. He had had yaws in childhood and carried scars from the lesions.

REPORT OF A CASE OF INTUSSUSCEPTION CAUSED BY A MECKEL'S DIVERTICULUM.

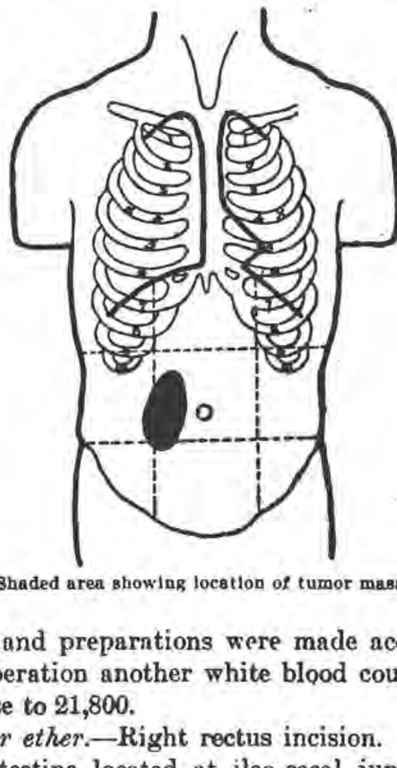
By A. M. FAUNTLEROY, Surgeon, United States Navy.

March 15, 1916: A—, assistant paymaster, United States Navy; age 24. Personal and family history negative. Before this attack has never had the slightest abdominal trouble.

On admission, about 11 a. m., patient complained of general colicky pain over entire abdomen. Temperature 98 F., and pulse 59. Right iliac region presented a slight bulging, which was tympanitic and at first thought to be gas in cecum. Nausea and vomiting were present, and patient had the facies of acute distress. While waiting for report of blood examination, a soapsuds enema with turpentine,

gtt. xv, was given twice. Considerable amount of gas was expelled each time, but there was no appreciable diminution in the abdominal pains. Morphin, gr. 1/4, was administered at this time and repeated an hour later on account of the continued and distressing abdominal pain.

About two hours after admission a large oval mass had developed to the right of the umbilicus, and more in the umbilical region than in the right iliac fossa. In view of the white blood cells (19,500) and the progressive nature of the abdominal condition, it was de-



Shaded area showing location of tumor mass.

cided to operate, and preparations were made accordingly. In the interval before operation another white blood count was taken, and showed an increase to 21,800.

Operation under ether.—Right rectus incision. Large corrugated mass of small intestine located at ileo-cecal junction. On gently manipulating this mass it was found to be an intussusception involving the lower ileum, which had passed through the ileo-cecal opening and could be palpated for some distance inside the ascending colon. By gentle traction and manipulation the intussuscipiens was slowly reduced, and showed that about 2 feet of the ileum had invaginated itself into the last foot of the ileum and passed on into the colon. A little over 12 inches of ileum was resected on account of mesenteric thrombosis and the softened, blackened condition of the gut. It was found that a Meckel's diverticulum existed about 3 feet from the ileo-cecal valve and was invaginated into the ileum, and that this latter condition had undoubtedly caused the intussusception. The

Meckel's diverticulum was about 2½ inches long. It was amputated and the stump buried by a purse-string suture. Abdominal wound closed in layers, leaving a small cigarette drain in lower angle. Reacted well from anesthetic.

March 16: Passed comfortable night without vomiting and was able to retain the continuous Murphy drip, containing glucose and sodium bicarbonate, of each 1 ounce to 1 pint of water. Given morphin, gr. 1/8, during night on account of slight restlessness. Temperature 100 F. and pulse 64.

March 17: Drain removed and wound redressed. There was a slight amount of distention, but patient is very comfortable. Temperature 100 F. and pulse 55 to 60. Murphy drip continued at intervals during day with passage of the rectal tube from time to time to remove gas.

March 18: General condition very satisfactory. Small amount of distention, which is relieved by rectal tube. Temperature, pulse, and respiration normal. Is not able to retain Murphy drip and it is consequently discontinued. Allowed 1-dram doses of water every 15 minutes by mouth. This latter was borne well and was increased during the afternoon.

March 19: Temperature, pulse, and respiration normal. Practically no distention. Allowed water ad libitum, to be taken slowly and discontinued in case of nausea. Albumen water and chicken broth, alternately, every two hours. Calomel, gr. 1/10, every half hour until gr. 1 is taken, to be followed by soapsuds enema. Enema brought away some gas and fecal discolored water. Patient was able to pass some gas voluntarily during the day.

March 20: General condition very satisfactory. Temperature, pulse, and respiration normal. Liquid diet continued. Enema every morning. Rested comfortably during day without any appreciable distention.

March 21: General condition continues to improve. Temperature, pulse, and respiration normal. No distention, but a small amount of gas has been passed voluntarily. Allowed small quantities of soft diet, such as soft-boiled egg, oatmeal gruel, milk toast, and custard. The first laboratory reports on the urine showed a renal disturbance indicated by a well-marked trace of albumin and numerous hyaline and granular casts, but recently the laboratory reports show that this condition has practically cleared up.

March 22: Skin clips removed. Completely healed except for small opening where the drain was removed.

March 29: Convalescing.

April 10: Up and around. General condition excellent.

April 27, 1916: Discharged to duty, cured.

ADVANTAGES NOTED IN THE USE OF McDONALD'S SOLUTION.

By P. R. Stalnaker, Passed Assistant Surgeon, United States Navy.

The following shows the relative merits of McDonald's solution and tincture of iodin as evidenced by the continuous use of both solutions extending over a period of several months:

M'DONALD'S SOLUTION.	TINCTURE OF IODIN.
Formula.	*Formula.*
Pyxol........................ 2 parts.	Iodin........................ 7 per cent.
Acetone........................ 40 parts.	Pot. iodid........................ 5 per cent.
Alcohol........................ 60 parts.	Alcohol........................ 100 c. c.
Applied same as tincture of iodin.	
Advantages and disadvantages.	*Advantages and disadvantages.*
1. Disinfects quicker and better than tincture of iodin. Estimated as 20 times more efficient than phenol.	1. Is not as good a disinfectant as McDonald's solution.
2. Does not injure metal instruments. Instruments can be left in this solution for weeks without injury or corrosion.	2. Injures metal instruments.
3. Costs much less than tincture of iodin.	3. Costs approximately 66⅔ per cent more than McDonald's solution.
4. Lesions heal more rapidly.	4. Lesions do not heal as rapidly.
5. Ingredients readily procured in United States. The slogan "Made in America" is applicable here.	5. Ingredients harder (since European war) to procure in United States. Foreign firms practically monopolize the trade.
6. Does not injure the skin to apply watery solutions following applications.	6. Injures skin and causes desquamation if watery solutions follow use of tincture of iodin.
7. Not necessary to protect serous covering, as peritoneum, following use.	7. Is necessary to protect serous coverings following use.
8. Evaporates rapidly.	8. Does not evaporate as rapidly.
9. Does not injure the skin.	9. Injures the skin.
10. Does not stain skin.	10. Stains skin.
11. Equally inflammable.	11. Equally inflammable.
12. Not as good a counterirritant.	12. Much better counterirritant.
13. Pleasant odor.	13. Not a pleasant odor.
14. Feels cool to the skin surface.	14. This cooling effect is not noted.
15. Splendid to cleanse and cut greasy particles from dirty wounds.	15 Action practically nil in this respect.

The above are the most salient differences noted in the use of these two solutions. The balance is greatly in favor of McDonald's solution. In compound, comminuted fractures dressed in McDonald's solution the results have been highly satisfactory and better than could have been expected if tincture of iodin had been used instead.

It does more efficiently the work we now generally require several solutions to do, i. e., tincture of iodin, liquor cresolis comp., phenol, bichlorid of mercury, etc.

The use of McDonald's solution is unhesitatingly recommended for general service use as a substitute for tincture of iodin and other antiseptics now in general use.

Attention is invited to the apparent similarity between pyxol and pine-oil liquid disinfectant. (Public Health Reports, Oct. 8, 1915, p. 3004.)

HEMATOMA OF ABDOMINAL PARIETES.

By J. S. TAYLOR, Surgeon, United States Navy.

On January 30, 1916, a coal passer of large frame, fine physique, and perfectly healthy appearance came to sick call complaining of pain in right iliac fossa. There was some tenderness and pain on movements involving the abdominal wall, but no headache, nausea, fever, rigidity, or constipation. He gave a history of sudden pain while at work and again when he kicked out hard in swimming, and spoke in a vague way of having accidentally hit himself with a slice bar or shovel previously. The health record gave 12 days of measles in 1914, 40 days for lymphadenitis left inguinal region (nonvenereal) in 1915, and 5 days for acute laryngitis in 1915. The patient was well thought of, known to be honest and straightforward, and incapable of malingering. He was put to bed and food withheld for several days. On the seventh day he was discharged to duty; diagnosis "strain of muscle."

On February 14, 1916, this man returned with identical symptoms, and was again put to bed and food forbidden. For three days there was slight temperature disturbance:

Feb. 14, maximum elevation	99.3° at 6.30 p. m.
Feb. 15, maximum elevation	99.2° at 8 p. m.
Feb. 16, maximum elevation	100° at 1 p. m.

After this the temperature remained normal. The fever had caused to be entertained a suspicion of appendicular involvement, but there began to be palpable, as fever subsided, some nodules along the margin of right rectus, well below level of navel. These slowly merged into a single firm tumor, dull on percussion, not tender to the touch, 2¼ inches in vertical by 1¾ inches in horizontal diameter, located apparently in or behind the right rectus. Heart, lungs, kidneys, and leukocyte count being normal, the following possibilities were considered:

(1) Strain of muscle.

(2) Trichiniasis (but there was no eosinophilia).

(3) Rupture of blood vessel, with abscess formation or organization of clot.

(4) Myositis, with degeneration—caseous or otherwise—such as the case reported by DaCosta as occurring in an identical situation.

On March 3, 1916, after the usual preparation of the patient, he was given ether and operated upon by Passed Asst. Surg. L. W. McGuire, United States Navy. An incision into the right rectus abdominis brought to light a rather soft blood clot, about 2 tablespoonfuls in amount, which was evacuated. The sheath of the muscle showed inflammatory changes and adhesions to the muscle.

The cavity was wiped clean with dry gauze and the incision closed *secundum artem* without drainage. The patient made an uneventful recovery and resumed the arduous duties of his rating, cured.

BAYONET WOUND OF THE ABDOMEN.

By W. B. HETFIELD, Assistant Surgeon, United States Navy.

During the time the *Monocacy* was stationed at Chungking, the largest port on the upper portion of the Yangtze River, the medical officer of the gunboat was offered and accepted complete charge of the French Catholic Hospital, an institution ably run by the Franciscan Sisterhood, the French Army surgeon ordinarily in charge having been recalled on account of the European war.[1] Many interesting cases were treated. The following is one of the most interesting and instructive:

History of case.—One morning a native walked into the dispensary complaining of "a cut in the abdomen." He stated that he had had a fight with a soldier three days before.

Physical examination.—After removing a number of blood and pus-stained rags, together with some newspaper, a large penetrating wound was found, which started just to the right of the right rectus muscle, high up, near the costal border, and completely severed this muscle. This wound was the point of entrance of the bayonet; the exit was found between the eleventh and twelfth ribs on the left side, the bayonet having completely traversed practically the whole of the abdomen. Through the wound of entrance protruded a mass of the greater omentum, the edge of the right lobe of the liver, and a small portion of the transverse colon. A large amount of pus was exuding from the wound, but at this time no fecal matter was noticeable; pus was also running from the wound of exit on the left. Heart normal; lungs, apical area of consolidation on right indicated tuberculosis; no fever; pulse rate 98.

Treatment.—Immediate operation was performed, assisted by the hospital apprentice, first class, one of the nuns giving the anesthetic (chloroform). The wound of entrance was slightly enlarged; all of the omentum that protruded from the wound was ligated and excised, it being in very bad condition. The gut was examined and replaced. No perforation was noticed. An extensive search for one, however, was considered inadvisable, as adhesions had well formed, which were apparently offering excellent protection from general peritonitis. The wound of exit was now enlarged and a tube drain

---

[1] See article in this issue, page 583.

inserted and run without difficulty between the ribs, across the abdomen, into the wound of entrance. Efforts were now made to suture the divided portion of the aponeurosis, which were successful. It was impossible to bring together the rectus muscle. Drains, both tube and gauze, were placed in all recesses, and the edges of the wound in one or two places were loosely drawn together.

Result.—Following the operation the patient had a rise in temperature to 103°, pulse 110. As both wounds were draining freely, his pulmonary condition was thought to be responsible. Three days subsequent to the operation fecal matter began to exude from the large wound. By the eighth day this had stopped, and the wound became a clear granulating surface. His temperature had likewise dropped, and from this time on his convalescence was uneventful. The man left the hospital perfectly well exactly one and a half months after admission. There was at the time apparently no tendency to hernia nor had one developed by the time we left Chungking, six months later. The fact that fecal matter finally exuded from the wound seems to indicate that a perforation developed, as it did not make its appearance for six days after the injury, at which time adhesions had formed so well that the major portion of the peritoneal cavity was safe; likewise it healed spontaneously, no sinus developing to necessitate a second operation.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

E. THOMPSON and J. A. RANDALL, Surgeons, United States Navy.

IRVINE, L. G. **Gassing accidents from the fumes of explosives.** Brit. Med. Jour., January 29, 1916.

The irritant acid fumes, commonly known as nitrous fumes, consist of a mixture of oxids of nitrogen. They belong to the group of respiratory irritant poisons in which chlorin, the vapors of bromin and ammonia, sulphuretted hydrogen, and sulphurous acid are also included. All of these cause, when inhaled, a somewhat similar train of symptoms. Fatal poisoning by nitrous fumes has occurred when persons have inhaled the acid fumes from a vessel containing nitric acid, which has been accidentally broken. After the use of explosives poisoning from this source only occurs in cases where the detonation has been imperfect, and particularly where burning of explosives has taken place. Nitric oxid (NO) is first formed, but this gas is rapidly oxidized, and nitrous fumes consist chiefly of nitrogen peroxid (NO_2). This again quickly reacts with water vapor to form nitrous acid. What is actually inhaled is mainly a mixture of nitrous and nitric acids. Nitrous fumes are the red irritant fumes with the smell of which most are familiar. The smell is that of fuming nitric acid. The gas is intensely poisonous, and of all gases it is the most treacherous. We do not know the downward limit of its toxicity. Exposure to as little as 0.05 per cent of nitric oxid for half an hour was found by Haldane to cause death in mice after about 24 hours, with the typical sequence of symptoms, and the symptoms were the same whether nitric oxid or the fumes of burning dynamite were added to the air. It was found that with small percentages of nitrous fumes the hemoglobin was normal at the time of death. With higher percentages (and more rapid death) the blood was found to be more or less chocolate colored, and to contain methemoglobin. Under the latter circumstances nitrous fumes act like carbon monoxid by disabling the hemoglobin, and may in concentration produce rapid death. Where the exposure is to small amounts death is due solely to the lung inflammation and its immediate consequences. It is with this latter form of poisoning that we are locally familiar. Half of the amount mentioned is the highest figure (0.026 per cent reckoned as NO_2) found by Mann in mine

air after blasting, but the presence of the gas in poisonous amounts is probably not so very uncommon in ordinary blasting practice. What is certain is that quite a brief exposure to small quantities of nitrous fumes is sufficient to produce serious and even fatal poisoning. Air which contains enough nitrous fumes to cause feelings of irritation in the nose or air passages is very dangerous.

Symptoms.—The symptoms of poisoning by nitrous fumes are very characteristic. At the moment of exposure they are slight. A man who inhales nitrous fumes has a sense of irritation in the nose and throat, and of constriction and perhaps pain in the chest. There is headache, smarting of the eyes, and there is coughing. The latter is a characteristic sign. But these immediate irritant effects may not be severe and commonly pass off altogether in a short time. The man may feel quite well and may continue work. He leaves the mine, has his supper, perhaps, and goes to his room. Then, in from perhaps four to eight hours afterward (very rarely later), acute symptoms suddenly come on and progress with alarming rapidity. In a typical severe case there is marked and increasing distress in breathing, with coughing, and often severe pain in the chest. The cough is at first dry, and auscultation may at this stage reveal no moist sounds. But this condition is speedily followed by the expectoration of a copious frothy, rather fluid, blood-stained sputum. The lungs become waterlogged, and auscultation now reveals copious moist sounds. There is cyanosis and marked dyspnea and distress, followed, unless the case is promptly treated and very often in spite of all treatment, by collapse, unconsciousness, and death within a few hours.

The typical sequence of symptoms in nitrous-fumes poisoning is therefore this:

1. Initial symptoms of irritation occurring at the moment of exposure and usually comparatively slight. Nitrous fumes never, in the author's experience of ordinary gassing accidents, produce partial or complete unconsciousness at the time of exposure, as does carbon monoxid, although they may do so if present in massive amounts, and cases of rapid death from the concentrated fumes of burning explosives may be partly due to this cause.

2. A latent period of several hours' duration, during which the patient may and commonly does feel quite well.

3. The sudden onset, after that interval, of acute symptoms, due to a rapidly progressive inflammatory edema of the lungs. The appearance of this well-marked symptom sequence is of great diagnostic significance.

The postmortem signs are also definite. There is an intense injection of the trachea and bronchi, which is characteristic. The lungs are intensely edematous, often enlarged and tense with

edema. A copious frothy, blood-stained fluid exudes from them on section, and may be seen to occupy the air passages. There may be patches of incomplete consolidation, subpleural hemorrhages may be observed, and blood-stained fluid in the pleural cavities or the pericardium. The right heart and the great thoracic and abdominal veins are engorged with dark, thick, sometimes almost tarry blood. The abdominal veins especially are often very greatly distended.

Medical treatment.—In all cases in the early stage first produce emesis as soon as possible (apomorphin hypodermically). Follow this by stimulant, ammonia, or (preferably) pituitrin. Then send the case straight to hospital.

Atropin may prove useful in the latent stage.

In the acute stage, with developing edema of the lungs, Macaulay recommends as the first step wet cupping of the chest, back and front. This invariably relieves the symptomatic distress. It should be followed locally by poulticing, or better, by jacket mustard-water fomentation, applied very hot and changed every hour.

In all recognized cases of acute edema free bloodletting should next be performed. This is a most valuable remedial measure. In one of Macaulay's cases, after venesection, the hemorrhagic sputum speedily ceased and never returned and the patient made an uninterrupted recovery. This has been confirmed by other observers. The condition of the blood may render bleeding difficult, but it should be free (12 to 20 ounces). Venesection should not be delayed until the condition becomes grave. It should be undertaken immediately on the recognition of the nature of the case.

Follow venesection by saline infusion, and repeat this if necessary.

Administer oxygen intermittently to relieve and tide over the asphyxial condition.

Give ammonia in repeated doses.

Injections of pituitrin (1 c. c.), repeated every four hours, should be tried. The author has found this drug, used in this way, of great service in the treatment of acute pneumonia.

These are the lines of treatment which have been followed and, in a considerable number of cases, with marked success, although when the condition of acute edema is well established probably a majority of cases will die in spite of treatment.—(C. G. SMITH.)

ROSENOW, E. C., and OFTEDAL, S. **The etiology and experimental production of herpes zoster.** Jour. Infect. Dis., xviii, No. 5.

In a brief historical review it is pointed out that since 1861 the etiology of herpes zoster has been considered an acute, inflammatory condition of the ganglion corresponding to the region affected. This theory has been supported by several men who have demonstrated in

a variety of cases the existence of an apparent bacterial infection which produced "pus infiltration of the Gasserian ganglion"; "hemorrhages were noted in and around the Gasserian ganglion"; "interstitial purulent inflammation of the ganglion"; "round-cell infiltration of the ganglion, destruction of the ganglion cells, and degeneration of the ophthalmic nerve; degenerative changes and hemorrhages within and surrounding the ganglion corresponding to area of herpes," etc. In 1900 Head and Campbell concluded "that herpes zoster is a specific infectious disease which confers immunity, the number of recurrences being between 1 and 2 per cent; that the specific virus has an affinity for the nervous system, particularly for the ganglion, in which there are found inflammatory changes, acute or chronic, according to the length of time between the appearance of the eruption and death." They proposed to consider the disease as an acute posterior poliomyelitis in contradistinction to acute anterior poliomyelitis. Cases have been cited in which there were febrile disturbances and swelling of the regional lymphatic glands.

Microorganisms have been demonstrated in the spinal fluid by several. A case has been reported by Magnus in which, following a grave motor disturbance with herpes zoster over the left side of the chest, pathologic changes were found in the third dorsal ganglion, consisting of hemorrhages and an enlargement of the blood vessels, which were surrounded by marked areas of round-cell infiltration extending into the periphery of the ganglion. In the ganglion proper there were hemorrhages and areas where only remnants of the ganglion cells remained. Round-cell infiltration was especially marked in the periphery about the blood vessels, occurring in small circumscribed areas. In the first, second, third, fifth, and sixth dorsal segments of the spinal cord there were found circumscribed areas of round-cell infiltration especially marked about the arteria centralis and its anterior horn ramifications. In the second dorsal segment diplococci were demonstrated. Pneumococci have been demonstrated in the vesicles which reproduce similar lesions by inoculating the organism into normal areas of skin in the same individual. Since pneumococci were also recovered from the blood, there is no reason to doubt the occurrence of lesions in the ganglion in these cases. It is believed also that herpes occurs on the mucous membranes of viscera of the respiratory and digestive system and the kidneys. Lesions of the visceral nerves of the ganglion have not as yet been demonstrated postmortem.

The finding of diplococci in the blister fluids, spinal fluids, and in the ganglion in these isolated instances is considered to suggest strongly that herpes zoster is streptococcus infection.

The authors made cultures in 11 cases of herpes from which were isolated 11 strains of streptococci. Sixty-one animals were injected

with 11 strains as isolated. Of these 70 per cent developed herpes of the skin, 15 per cent herpes of the eyelids—a total average of experimental herpes in 75 per cent. The lesions varied from those very small, just recognizable, to others very large and marked, were usually unilateral, especially after the injection of small doses, although after the injection of large doses bilateral herpes occurred rather often. In some instances the location of the herpes in the animals corresponded rather closely to that in the patient from whom the cultures had been obtained.

Pathologically the posterior roots of ganglia corresponding to the areas of herpes of the skin nearly always showed hemorrhages and edema, and smaller hemorrhages were usually found about the neighboring ganglia in those animals having severe herpes. The hemorrhage at times extended for a short distance along the sheath of the spinal nerve and the hemorrhages about the ganglion and the posterior roots at times extended into the loose connective tissue of the external and posterior portion of the dura. Herpes of the face, the eyelids, and the tongue was usually accompanied by hemorrhage of the Gasserian ganglion. Herpes of the viscera occurred chiefly after injection of large doses in animals showing marked bilateral herpes of the skin, and was always accompanied by hemorrhage and edema about the ganglion of the vagus or sympathetic nerve or both. Microscopical examinations of the skin showed desquamation, hemorrhage, leukocytic infiltration, and at times thrombosed blood vessels in which were found staphylococci, streptococci, and bacilli. The lesions in the ganglion and the adjacent nerve trunks consisted usually of small areas of hemorrhage and round-cell infiltration immediately surrounding the capsule of the ganglion or the associated nerve sheath and around the accompanying blood vessels, which usually showed complete or partial thrombosis, the thrombi consisting of polymorphonuclear leukocytes, enlarged mononuclear cells, and fibrin. Diplococci often in large numbers were found in the hemorraghic and infiltrated areas of the spinal, vagus, and sympathetic ganglia, but not in the portions free from changes or in the normal ganglia.

In the summary the authors reached the conclusion that it would appear that herpes zoster is due to a streptococcus having elective affinity for the ganglion and the posterior roots; that it would appear that the atrium of infection is not only the place of entrance but the place where the steptococci by growth in symbiosis with other bacteria and under varying grades of oxygen pressure may acquire the peculiar properties necessary to infect in this particular manner. The possibility, however, that the disease in some instances may be due to other bacteria having a similar affinity must be admitted.—(W. E. EATON.)

FRIEDENWALD, J., and LIMBAUGH, L. **The Allen treatment of diabetes.** Interstate Med. Jour., February, 1916.

The treatment of diabetes, as devised by Allen, was first carried out on dogs. It was observed, that by destroying a portion of the pancreas, and then producing glycosuria, this condition could be overcome by fasting, and that the animal could then be placed on a diet, which would maintain life without producing glycosuria again. He applied this principle in the treatment of patients affected with diabetes. According to this plan the patient is kept in bed and fasted until the glycosuria disappears, and perhaps for 24 to 48 hours longer. Water, however, can be taken freely. With the fast the acidosis diminishes and often disappears.

Inasmuch as alcohol does not produce glycosuria and has a tendency to decrease acidosis, it may be prescribed during the fast, especially if an acidosis is present. It is especially useful as a food, as it does not produce glycosuria. There is no contraindication to the use of the alkalis if coma seems threatening, though even in this condition, they are rarely needed. When the patient has been sugar-free for 24 to 48 hours, he is placed on a diet of vegetables containing 5 per cent of carbohydrates. If sugar should again appear, another fast day should be prescribed. The original fast may last from three to eight days, but usually not over four days; after this the fast need not be longer than one day. Starvation is well tolerated and the patient loses flesh; according to Allen, a moderate loss of weight is of advantage to the patient. There are no contraindications to the fast, except perhaps nausea, vomiting, and great prostration; if these symptoms supervene they can be overcome by feeding, and then, after a short period, another fast can usually be undertaken without their reappearance. Such complications as carbuncles, beginning gangrene, and infections, are special indications for the employment of this plan of treatment and are directly overcome by the fasting.

After the urine is sugar-free for one or two days, the carbohydrate tolerance of the patient is estimated. Vegetables containing 5 per cent of carbohydrates are first allowed. At first but 150 gm. of these vegetables should be taken per day. This quantity can be gradually increased to an amount to make 25 gm. of carbohydrate, and then gradually up through the 10 per cent, 15 per cent forms, and the 5 per cent and 10 per cent fruits, and up to the 20 per cent carbohydrate foods. The carbohydrate tolerance of the patient is estimated daily, and at the first appearance of the slightest trace of glycosuria the patient is again fasted, and the vegetables of the 5 per cent variety again given and increased cautiously, but kept below the limit of tolerance.

On the day following that on which the vegetables are first allowed (the urine remaining sugar-free) the proteids are gradually added, beginning with 20 gm. a day in the form of eggs and meats, and are increased daily until the patient is receiving, according to Joslin, 1.5 gm. of protein per kilogram of body weight. Fats have already been taken in small quantities with the proteids in the eggs and meats and are increased gradually. These are best given in the form of butter, cream, and olive oil, but not more than 200 gm. per day should be taken. It is quite as important to estimate the fat tolerance as that of the carbohydrates and proteids, for while there is no evidence whatsoever that sugar is produced by fats, there is no doubt but that glycosuria is very apt to supervene in severe cases of diabetes on the addition of quantities of fats, such as butter and olive oil. It is probable, according to Allen, that the glycosuria is produced in these cases by the stimulating effect of the fat on metabolism.

Among the facts brought out by the Allen treatment is one of great importance; that is, that in order to prevent a return of glycosuria the diet should be increased gradually from the starvation days, and that the increase in proteids and fats should be regulated just as carefully as the carbohydrates and kept within the limits of tolerance.

In the event of the reappearance of glycosuria after the increase of the diet, starvation should be again resumed for a day or two until the sugar disappears, and the diet should then be increased cautiously. It is also well to prescribe, especially in the severe forms of diabetes, starvation days once a week or once in 10 days, while in the milder cases vegetable days will usually suffice. Even though a patient is sugar-free, it is best not to increase his diet too much; that is, if he is taking 60 gm. of proteids, 40 gm. of carbohydrates, and 200 gm. of fat a day, he is consuming quite sufficient food, and these quantities should not be increased.

According to Allen, an initial loss of flesh need not cause alarm and, in fact, is of benefit to the patient. After the patient is sugar-free there is no objection, however, to a gain in flesh, but this should not exceed the original weight.

Allen has also observed that exercise increases the tolerance of patients with diabetes, both for carbohydrates and proteins. In the stronger patients the initial fast may be shortened by this method, and in other individuals exercise may be begun as soon as the glycosuria and acidosis have subsided. According to Allen, if glycosuria appears after the carbohydrates, proteins, and fats have been added to the diet, it is often possible to overcome this condition by exercise while continuing on the same diet. It is especially important to prescribe exercise immediately after meals containing carbohydrates,

which have a tendency to produce glycosuria, but exercise can be taken at any time. It is best to encourage short courses of severe exercise with periods of rest, rather than long-continued exercise, such as long walks, which may cause fatigue. Allen advises such exercises as running up and down stairs, jumping rope, turning somersaults, and tennis. While fat is being reduced by exercise the muscular tissue is built up and the "flabby-muscled" diabetic is turned into an athlete as far as practicable.—(J. A. R.)

McCrae, T. **Chronic arthritis.** Pennsylvania Med. Jour., April, 1916.

The author directs attention to questions bearing on the etiology of chronic arthritis. He points out that in those cases in which we are sure of the etiology as gonococcal, tubercular, or syphilitic, we get better results because of this knowledge.

He enumerates factors causing permanent damage to a joint, as follows: (1) Injury; (2) metabolic conditions; (3) wear and tear; (4) trophic disturbances. These four groups account for only a small proportion of the cases, and it is probably a fair estimate to say that they do not comprise over 5 per cent of all cases of chronic arthritis, if, indeed, as many. We must turn to some other cause for the overwhelming majority. There seems only one possible factor and this is found in:

Infection. The evidence is strong in favor of the view that this is the predominating factor in the majority of cases. In some, as already noted, there is no question of the positive infective cause, but it is to the large remaining group—the arthritis cases—that special attention is directed. If we could be sure of the etiology here it should aid us in the problem of treatment. It is probable that the question of infection means in some cases the presence of organisms in and about the joints, and in others only the effects of toxins. In either case the source of infection is away from the joints. We have an illustration in gonococcus arthritis, in which apparently not every patient has organisms in the affected joint. In either case, organisms or toxins, the arthritis is secondary to a focus of infection elsewhere. In this connection it is well to remember that arthritis is not a primary lesion; it is always a secondary one.

The evidence in favor of the view that these forms of arthritis are due to infection may be noted:

(*a*) *The results of cultures.*—An increasing number of cases is accumulating in which the cultural results have been positive. Some of these which claim a specific organism as the cause of the arthritis can not be regarded as proved. The evidence rather points to a variety of organisms, and probably in the majority of cases some

variety of streptococcus or a closely allied organism is concerned. There does not seem any reason why other organisms, such as the colon bacillus, may not be responsible in some cases.

(*b*) *The results of the treatment of foci of infection.*—There are a considerable number of cases in which the association of proper treatment of the focus of infection and improvement in the arthritis is too close to be coincidence only. We see the same point demonstrated in cases of gonorrheal arthritis, in which treatment of the local lesion is so important.

(*c*) *The similarity of the lesions to those produced by proved infectious agents.*—This is seen in the likeness to the gonococcus arthritis in the peripheral joints and in the changes in the spine in the spondylitis of arthritis deformans, which are similar to those found in typhoid or gonococcus spondylitis.

(*d*) *The occurrence of other changes suggestive of infection.*—Among these are adenitis and enlargement of the spleen. The enlargement of the lymph glands may be general, especially in the younger patients, but is usually most marked in the glands which stand in direct relation to the most affected joints. The splenic enlargement is usually more marked in the younger patients. The occurrence of pneumonia, pleurisy, myocarditis, endocarditis, and pericarditis with the arthritis in a certain proportion of cases is also significant. The frequent occurrence of fever must also be taken into consideration. The degree of this varies greatly, but many of the patients show a tendency to prolonged slight fever, suggesting an infection of low grade which does not excite a vigorous response, or a low resisting power. To be correllated with this is the fact that often the patient with an acute attack and high fever seems to have a better outlook; the vigorous response may mean a strong resistance.

(*e*) *The results of experimental work.*—These are striking, and similar lesions in animals can be produced by the organisms obtained from patients with the disease.

Early diagnosis: With the view that the cases of arthritis under discussion are due to infection somewhere, the diagnosis should endeavor to include the determination of this. Measures directed to the joints are necessary and important, but they are only concerned with the results. The finding of the original focus of infection is more important. It is not well to think that this is an easy matter; sometimes it is, but more often the search is difficult. The possibility of infection from the nasal and mouth cavities has always to be considered. Much attention, and properly so, has been given to the important part played by infection in the mouth. Infection about the teeth is a frequent cause, and it is not always easy to exclude this. There may be a pus pocket at the root of a tooth, which gives

no discomfort. Fortunately many of the dental profession are awake to the possibility of this, but many seem to hold that if a tooth does not cause pain and is not tender it can not be responsible. The X-rays have taught us the incorrectness of this. In doubtful cases an X-ray examination of the teeth should be made.

Infection of the respiratory tract, urinary tract, and pelvic organs have to be considered, and in males infection of the prostate should not be forgotten. This is an easily overlooked but not infrequent source of infection. One other possible source is difficult to determine, the intestine. This is not intended to suggest so-called "intestinal autointoxication," but infection from the intestine. There seems little doubt of this in some cases, but it is difficult to prove; yet there are analogies. The greater occurrence of pyelitis in the right kidney is apparently due to the arrangement of the lymphatics on that side permitting of more ready infection from the bowel. It is always wise to consider the possibility of intestinal infection if no other source can be found.

In general the measures to be adopted are: (1) Early recognition before material damage is done so that the proper measures can be adopted at the onset; (2) thorough search for the focus of infection and efficient treatment of this if found; (3) every effort to improve the patient's powers of resistance, and this is particularly important if the source of infection can not be found, in the hope that the patient may overcome the infection by his own powers of resistance; (4) the effort to lessen the damage to the joints, under which head come the proper use of exercise and rest; local measures such as aid the circulation or relieve pain; (5) the relief of the pain both for the sake of the patient and to allow of movements in some cases; (6) the prevention of deformities.—(J. A. R.)

MENTAL AND NERVOUS DISEASES.

R. SHEEHAN, Passed Assistant Surgeon, United States Navy.

MILLER, S. R., BRUSH, N. D., HAMMERS, J. S., and FELTON, L. D. **A further study of the diagnostic value of the colloidal gold reaction, together with a method for the preparation of the reagent.** Bull. Johns Hopkins Hosp., December, 1915.

This is an exhaustive consideration of this test which leaves nothing to be said concerning it. The consensus of opinion seems to be that it is of great value and that in it we have an additional efficient diagnostic measure on the laboratory side.[1]

[1] See abstract: A Critical Study of Lange's Gold Reaction in Cerebrospinal Fluid. NAVAL MEDICAL BULLETIN, July, 1915, p. 475.

The writers take up all phases, including the principles on which it is based, the routine employed, the preparation and standardization of colloidal gold, the clinical material utilized, a comparison with the Wassermann reaction and with other spinal fluid reactions. They conclude that their results confirm those of Miller and Levy in 1914, and they may be summarized.

1. In the great majority of cases a normal spinal fluid produces no changes whatever in suitably standardized solutions of colloidal gold. The evidence is strongly in favor of the view that very slight reactions, occurring in fluids otherwise normal, probably possess no diagnostic significance. The fact that colloidal solutions in general are usually sensitive, makes it highly probable that these faint reactions are due to factors which the most scrupulous technic can not invariably eliminate.

2. The general reactions observed in locomotor ataxia and cerebrospinal syphilis are not in themselves characteristic of either condition. As a rule the curves are typically of the luetic type and are therefore valuable in confirming a doubtful clinical diagnosis, particularly in cases where one or more of the other reactions are negative. It is probably true that the reactions in cerebral lues vary with the type and stage of the disease. Further studies are necessary to determine the exact significance of the paretic curves observed in a few cases showing no clinical evidence of general paralysis.

3. The reaction type observed in cases of paresis has been so uniformly present and so characteristic as to warrant the following conclusions:

(a) Spinal fluid from *clinical* cases of dementia paralytica causes complete precipitation of collodial gold in the first 4 to 8 tubes without exception.

(b) The apparent specificity of this paretic reaction is further shown by its occurrence in a number of typical cases in which all other spinal-fluid abnormalities were absent. One such case has been confirmed postmortem.

(c) The fact that a paretic curve occasionally occurs in patients who show no evidence of dementia, in no way argues against the value of the reaction. All such reactions have occurred in cases undoubtedly luetic, with the exception of a few cases of multiple sclerosis, but none were followed long enough to assert that paresis will not ultimately develop. General paralysis has been shown postmortem where no psychotic symptoms had been evident. In remissions where the mentality has been relatively high, necropsies have shown well-marked and active lesions of paresis and in clinically short cases there has been anatomical evidence that the disease existed long before symptoms made it known.

(*d*) The opinion is advanced that the recurrence of a paretic reaction in a luetic individual should invariably be looked upon as one of grave portent, for, although paresis may not be outspoken it is reasonably sure that even prolonged intensive treatment will not modify the underlying disease process to any appreciable degree.

4. Abnormal changes, not necessarily luetic, in the central nervous system, which permit dialyzable substances to occur in the cerebrospinal fluid, will simulate the reaction.

5. Fluids from purulent or tuberculous meningitis may give reactions which are maximal in the higher dilutions, but the tubercle bacillus can be shown previously.

6. In congenital lues the chart should not be relied upon alone, but in juvenile paresis is indicative.

7. The reaction should not replace other fluid tests. It seems most sensitive and specific. It has few sources of error, and these are readily recognized; its results are for the most part clear and decisive; it requires a minimal amount of spinal fluid and a technic of extreme simplicity.

8. The reagent must be suitably prepared and standardized.—(R. S.)

WHITE, W. A. **Psycho-analytic tendencies.** Seventy-second Ann. Meet. Am. Medico-Psychol. Assn., New Orleans, April 5, 1916.

This was an attempt to show that the psycho-analytic movement, instead of being an isolated affair, is more and more showing that it is connected with all the other sciences and with philosophy, as is shown by the relation between psycho-analytic conceptions and psychology, physiology, pathology, and general medicine. Psychoanalysis began as a therapeutic approach to the problem of the neuroses. In its hypothesis of the unconscious, however, it opened up the whole problem of the history of the development of the psyche. It sees now in the hegemony of the psyche the culmination of the integrative development of the individual, and is therefore beginning to look to the psychological level as the final representative of the efficiency of all other reacting levels.—(R. S.)

ORTON, S. T. **Some considerations of general paralysis from the histological viewpoint.** Seventy-second Ann. Meet. Am. Medico-Psychol. Assn., New Orleans, April 4, 1916.

This was a paper of great merit. He considers that paresis is becoming recognized as a histological rather than a clinical entity. The criterion is that of widespread "mantle infiltration" with plasma cells. Border-line cases are those of cerebral syphilis. The

distribution of lesions in typical general paresis often suggests a multifocal attack rather than a diffuse inflammation. There is question of neurotropic strain of the treponema or an alteration due to long residence in the host and there are facts which are consistent with either view. He believes that paresis means a high resistance of the host to syphilis and this accounts for the 6 to 15 year incubation period. There is the possibility of prepsychotic paresis. He also considers that the chronic process has its original site in the arch of the aorta, where it resides for a long time unknown; that is, without symptoms. It is because it spreads from this point that we find the preponderant frontal localization of paresis. The site and type of lesion are both important in determining the clinical course. Probably treatment to be effective must be early—possibly in the prepsychotic stage.—(R. S.)

DUNTON and SARGENT. **The duration of paresis following treatment.** Seventy-second Ann. Meet. Am. Medico-Psychol. Assn., New Orleans, April 4, 1916.

The writers concluded that the duration of life in paresis is much reduced by intensive treatment, and were impressed with the large percentage of paretics who had died within a comparatively short time after being treated by salvarsan administered by the Swift-Ellis method or some of its modifications. They agree that marked remissions are not unusual, but fatal termination usually occurs earlier than in cases which have received other treatment or no specific treatment.

In discussion Orton believes the explanation of this is that salvarsan is a spirocheticide, and kills the organism, which being a living organism is a constant producer of antibodies, and that syphilis of the central nervous system is multifocal; that is, a particular lesion produces only local immunity and that when a lesion in one place heals another occurs some place else. The destroying of a few colonies of treponemata in given positions does not affect those located elsewhere. In fact, if there is any general immunity it is reduced, which is quite contrary to the action of a vaccine or antitoxin, which stimulates the production of antibodies.—(R. S.)

Discussion of treatment in general paresis. Meet. New York Neurol. Soc., October 5, 1915. Jour. Nerv. and Ment. Dis., March, 1916.

Ogilvie reported a series of 35 cases, all of which presented the classical syndrome of dementia paralytica and gave positive serobiologic findings of syphilitic disease in the cerebrospinal fluid, and all but two gave positive reactions in the blood serum. His method

is a modification of the original Swift-Ellis, the curative serum being prepared in vitro, and is of standard strength. The number of treatments given was 21; the minimum number required to produce a remission was 6, and the maximum 14. Salvarsan intravenously and mercury intramuscularly were given systematically, the intravenous treatments being scheduled to alternate with the intraspinal.

Complete clinical remissions occurred in 12 cases, or about 34 per cent of the total. All of these were totally incapacitated for work of any kind. In each the remission was clinically complete, 9 having resumed their former vocations in life, the average duration to date being 14 months, the shortest being 9 months, and the longest 1 year and 8 months. At the laboratory level 4 of the 12 are completely negative in both the blood and spinal fluid, 8 are normal as regards cell and globulin contents, but positive to the Wassermann reaction in the stronger titrations. There was a disappearance of tremors and an appreciable improvement in the pupillary light reflex in 3 cases. All showed marked improvement in general health.

In 14 cases incomplete remissions occurred which made the patients socially possible. These remissions averaged 12½ months. There was a reduction at the laboratory level, especially in the cell counts, but in none did the Wassermann reaction become negative.

Nine cases are regarded as failures, and it is noted that some of these were the most promising in the beginning and were not influenced by treatment.

As to permanency of the results, no prediction can be made. In true parenchymatous disease of the brain it is practically impossible to secure a complete negative Wassermann reaction, and when it is obtained we must consider that the process is confined largely to the interstices of the cerebral tissue. Remissions of several years' duration are recorded which occurred spontaneously and without treatment, and these no doubt showed positive biological findings throughout, even without psychotic manifestations. Other factors than the character of the laboratory findings determine a remission or its duration, and they are as elusive as those that determine the escape or the involvement of the central nervous system in the beginning.

The provoking of a remission is something gained, but it is not the only indication of the value of intraspinal treatment, which shows a far greater percentage of results than the most heroic of the older methods. It must be employed early, before the parenchyma is involved degeneratively. The treatment should be regular, prolonged, steady, and even, well within the patient's tolerance.

Amsden, of Bloomingdale, reported 16 cases, in which 62 per cent greatly improved but only 12 per cent retained improvement for a long period. Its favorable results must be read in terms of remis-

sion, which is impaired as a criterion because of the remissions without treatment. The duration of the remissions was in 25 per cent over a year and in 19 per cent between 6 months and 1 year, and in 19 per cent at least three months. On the physical side there was little change noted. Mentally there was regained insight, which was quite complete, with a serious mood and even mild anxiety, which is quite in contrast to the complacency seen in contracted cases. The advantage attained is that a large per cent enjoyed a period of well being closely approximating normality, which lasted from 6 to 15 months. From the family standpoint this is important, as it enables patients to adjust their affairs.

The most favorable results were those in which the cell count was gradually and progressively reduced to normal. The Wassermann was reduced, but did not parallel the clinical improvement. An increase in cell count preceded an unfavorable clinical change.

Cotton, at Trenton, reported 75 cases. He emphasized the necessity of treatment in the incipient stage to obtain results. The symptoms of incipient paresis should not be difficult to recognize, and in a large number of cases there were shown definite periods, from 3 to 10 years, before admission to a hospital, when the patient had evidenced some neurological or psychic disturbance. Sensory symptoms were shown, such as dizzy spells, delirious episodes, mild depressions, neurasthenic conditions, irritability, change of disposition, general inefficiency, and on the neurological side, paresthesias, bladder disturbances, defects of vision, changes in the pupils, alterations in the writing and gait, high blood pressure without apparent cause. With such symptoms in a man of middle age or even younger, especially if there is a history of syphilitic infection, the blood and spinal fluid should be examined. It may be that earlier characteristic laboratory findings of paresis may be found before the disease shows clinically at all or at least before the parenchyma is seriously involved. He uses the Ogilvie method. The cerebral puncture of Widner might be more permanent in results and less likely to relapse so much. The mercurialized serum of Byrne might prove just as efficient as salvarsanized serum. Its small cost is a great advantage. A persistently strong Wassermann reaction in the spinal fluid is a bad prognostic sign. The intraspinal treatment is not dangerous. In 800 treatments only 3 showed irritative effects and these cleared up in a few days, but there was severe pain.

Remissions were produced in 33 per cent of cases with treatment, against 4 per cent without. The treatment improved the physical condition and prevented the patients becoming useless and bedridden. Regular treatment produced the best results and interruption of the treatment is dangerous.—(R. S.)

SURGERY.

A. M. FAUNTLEROY, Surgeon, and E. H. H. OLD, Passed Assistant Surgeon, United States Navy.

SPITZY. **The artificial-limb question.** München. med. Wchnschr., Feldärztliche Beilage, October 12, 1915.

The matter of providing means of locomotion without the use of crutches for the many hundreds who have lost one or both legs presents a serious problem when, as now, in Europe it is altogether impossible to obtain artificial legs in anything like sufficient number. The author condemns utterly the use of crutches just as soon as they can possibly be dispensed with because of their crippling effect on the upper body and their failure to develop in any way exercise of such parts of the injured leg as may still be left upon which to build up a serviceable member; moreover it is a matter of much importance merely to get these men out of bed so that they can look after themselves and thus release the attendants to the service of the endless stream of fresh arrivals of wounded. The article, which is worthy of the most careful study of anyone interested in this subject, deals principally with the loss and substitution of the lower limbs. The methods developed in the Imperial Orthopedic Hospital and Invalid School in Vienna in treatment of stumps and extemporizing of artificial legs are minutely described and illustrated. For example: Just as soon as a one-legged patient can be gotten out of bed he is given a small, light, thinly padded chair on which the stump rests and he begins to get around with this chair instead of using crutches. This leaves him one hand entirely free, gives exercise to the amputated leg and hardens the stump. Coincidently an effort is made to develop what the author terms an "hour-glass" stump instead of the usually-found conical stump, this with the idea of giving a better hold for the improvised leg to be fitted later on. This very slight constriction (*Schnürfurche*) is said to afford a particularly good hold for the artificial leg, thus giving that sense of security so essential to learning quickly the management of an artificial limb. Cases of amputation of both legs are fitted with improvised, reinforced plaster-of-Paris or basket-wicker legs and started off with two canes. Provision for the upper extremities is also described as well as the further training of these crippled men in the trade school associated with the hospital.—(P. J. WALDNER.)

REDWITZ, E. F. V. **The treatment of war injuries of the upper arm.** München. med. Wchnschr., Feldärztliche Beilage, October 12, 1915.

The author emphasizes the urgent need of serious study of the orthopedic after-treatment of battle injuries, particularly those of

the upper arm, with a view to giving the maximum functional usefulness to a crippled member and thus enabling the man to earn a living. This is a far-reaching economic consideration when dealing with vast numbers of injured such as a modern war leaves. No time, says the writer, should be lost in instituting orthopedic treatment whenever the condition of the wound permits, in order to prevent those distressing conditions of permanent ankyloses which practically render an arm useless when healed. The author deals primarily with injuries to the shoulder and upper third of the humerus and describes his results with splints so designed as to give extension to the humerus while permitting pronation and supination and limited flexion and extension of the forearm. The arm is treated in the position of abduction with the foregoing modification, and an arrangement is provided whereby gradual adduction may be instituted as soon as the healing process at the shoulder permits such movement. The arm splint is maintained in the position of abduction by a support resting by means of an angle brace on a vertical piece strapped to the patient's side under the axilla and having along its length five or six deep notches into which the foot of the angle brace may be set, gradually lowering the support and again raising it by means of these notches, thus giving the movements of abduction and adduction to the arm. Briefly, this is the outstanding object of the author's paper, which, however, also deals fully with all the anatomical and surgical considerations of injuries to joints in general.—(P. J. WALDNER.)

NEUHOF, H. **The inefficiency of pyloric exclusion of fascial bands.** Ann. Surg., April, 1916.

The author gives a table of 13 experiments made on dogs. Two methods of closure were used: Either a strip of fascia lata was tightly ligated around the pylorus, or the fascia as a broad band was sutured snugly about the pylorus and infolded by tiers of sutures.

In one case, after six days, the pylorus was found water-tight. In the other cases extending over a longer period, up to five months, the opening in all was found patent or became patent when moderate or slight hydrostatic pressure was used.

Neuhof, from the experiments made, does not agree with Gibson and Beekman in their conclusions regarding the use of the fascial band as reported in their article, "Occlusion of the Pylorus," Annals of Surgery, April, 1915.[1]

There were two deaths in the series from disturbed mechanical arrangements, the sequel of incomplete pyloric occlusion.

---

[1] Reviewed in the NAVAL MEDICAL BULLETIN, October, 1915.

The conclusions reached are:

(1) Experimental evidence of pyloric exclusion by fascial bands is incorrect, observations having been made too soon after operation.

(2) Permanent pyloric occlusion does not follow experimental ligation with fascial bands.

(3) Temporary pyloric occlusion is uncertain after experimental ligation with fascial bands.

(4) Experimental pyloric occlusion by fascial bands is likewise unsuccessful after crushing the pylorus or after application of irritants to the pyloric mucosa.

(5) Experimental pyloric ligation by fascial bands may be fatal, apparently from disturbed mechanical arrangements following incomplete occlusion.

(6) The clinical application of pyloric exclusion by fascial bands, therefore, rests on an unjustifiable experimental basis.—(E. H. H. O.)

GIBSON, C. L. **Postoperative intestinal obstruction.** Ann. Surg., April, 1916.

In the author's service at the New York Hospital during the past three years there were 34 operations for intestinal obstruction, 24 of which were due to the sequelæ of previous operations. Seven of these cases occurred while the patients were still in the hospital.

Two kinds are mentioned; one directly follows an abdominal operation, the second results from subsequent formation and persistence of adhesions.

The latter kind forms the largest single variety of acute mechanical obstruction. In late obstruction the time elapsed from previous operation varied from 25 days to 21 years. In a large proportion the obstruction developed insidiously, from a chronic incomplete to a complete.

The mortality of this series was 57 per cent for those occurring late, and 43 per cent for those occurring in convalescence.

Some slight degree of adhesion probably occurs even after the most perfect technic and in the simplest operations; such is only temporary and disappears. Even under such conditions, however, adhesions of the most damaging nature may result; as an illustration of which the author mentions having had to operate for an obstruction following the performance of an interval appendectomy with satisfactory technic and inversion of the stump.

There are two kinds of obstruction directly following operation: One mechanical, the other paralytic. In many cases it is difficult or impossible to tell which is present.

The mechanical form is due to agglutination of the coils of intestine and omentum to each other or to the abdominal wall. A considerable proportion of these spontaneously disappear. They are

easily overcome by reestablishing intestinal peristalsis; therefore this should be done early, also to prevent the paralytic variety.

The mechanical obstruction does not ordinarily come on directly after operation, whereas the paralytic occurs in the course of the first few days. The patient may be apparently convalescent and have passed a stool and flatus; abdominal distention moderate. Suddenly, in 5 or 10 days, general demeanor indicates his condition has become worse. First symptom usually is vomiting, varying according to location of obstruction. Distention likewise varying. Enema may give good result by emptying lower bowel only, without change in general condition. Passage of gas by tube, and not independent of such, is also misleading. When patient's condition is good the author has given charcoal powder, followed by a brisk cathartic, to prove if intestine is patent. The diagnosis is often most difficult.

Paralytic ileus is, chiefly, the arrest of peristalsis coming in the presence of a septic process; and there is a smaller class not due to sepsis but merely a reflex inhibition as the result of the irritation or shock of operation.

Ordinarily the picture is that of a septic peritonitis. Abdominal symptoms are particularly tympanites, pain, tenderness and marked rigidity of the abdomen, persistent and repeated vomiting, and the absence of stool or flatus. There is no response to catharsis. Condition is progressive and patient dies usually in about three days.

In this class of cases the author considers that pituitrin is a veritable life-saver, and to state such was the chief reason he wrote this article. All other intestinal excitants had failed him, including eserin, hormonal, and croton oil. Enterostomy had never seemed of value and had never succeeded with him; it should not be resorted to until after a trial with pituitrin. The histories of five cases are quoted to show the great value of this drug in competing with this condition.

The methods of using pituitrin.—It is important to have fresh and stable solutions. It is administered hypodermatically into the muscles. An ampule (1 c. c.) is given and repeated every hour up to three doses; subsequent doses two hours apart. He has never given more than five doses in 24 hours. In mild cases two doses are usually all that will be necessary.

The author has never given it intravenously, as recommended by some, but would possibly do so in small quantities.

He has occasionally used it in less serious cases where quick results were desired.

In one of the cases quoted a marked collapse occurred, endangering the patient's life, but she recovered from the collapse and also from the obstructing condition.

A table with summary of 24 cases is given.—(E. H. H. O.)

EASTMAN, J. R., ERDMAN, B., and BONN, H. K. **Index of toxicity of novocain-adrenalin injected intravenously.** Ann. Surg., May, 1916.

Novocain is looked upon as the ideal drug for local anesthesia, superseding alypin, tropacocain, stovain, eucain, and aneson.

The writers, by massive infiltration, have amputated the arm and leg, and performed double amputation of the breast, without causing pain, using novocain-adrenalin alone. They have employed as much as a gram of novocain in one operation, and 1.6 grams were used in the double breast amputation.

The toxicity of novocain as compared to cocain is as 1 to 7. Idiosyncrasy has been observed. Toxic symptoms are: Nausea, restlessness, acceleration of respiration, sweating, pallor, disturbances of vision, and deafness. After large doses clonic-tonic spasms and opisthotonos have been observed.

The rare fatalities that have occurred after the use of novocain are believed to be due to the drug having been injected into a blood vessel, usually a vein, as hemorrhoidal vein, or vein of neck or floor of mouth. When intravenous injection is used, after first rendering a limb ischemic as advocated by Bier, Hitzrot advised washing the veins out with salt solution before letting up on the constricting bandage.

The authors, in order to determine the toxicity of novocain and adrenalin injected intravenously, made a number of experiments on rabbits, the injections being made in the marginal ear vein. The following conclusions arrived at are given verbatim:

"(1) The index of toxicity of novocain-adrenalin, when administered intravenously in the proportions given above (referring to the recorded experiments), is, as would be expected, much higher than when given subcutaneously. Hirschel, as was noted, found the fatal dose of novocain by subcutaneous injection in rabbits to be 0.73 gram per kilogram of body weight. If injected intravenously, the average fatal dose in rabbits of novocain-adrenalin in the usual proportions is probably somewhat less than 0.02 gram per kilogram of body weight. In these experiments the lethal dose of novocain combined with adrenalin chlorid when administered intravenously in rabbits was 0.019 gram per kilogram of body weight. When using novocain alone it was observed that the amount of novocain necessary for a lethal dose was 2⅖ times the dose required when combined with adrenalin chlorid—that is, the lethal dose of novocain alone was 0.0456 gram per kilogram of body weight. Thus the toxicity of novocain injected intravenously appears from these experiments to be about 16 times greater than when injected subcutaneously.

"(2) It was observed that two rabbits died of respiratory failure.

"(3) The fatal dose being many times smaller by intravenous in-

jection than by subcutaneous injection, it follows that caution should be employed in injecting novocain-adrenalin solution that the point of the needle does not enter a blood vessel, since especially in individuals having idiosyncrasy against novocain or adrenalin serious harm may be done.

"(4) Indifferent dosage and careless use of novocain solution in subcutaneous injection is inexcusable, although in persons not having an idiosyncrasy against novocain there is a considerable margin of safety if less than 2 grams are used.

"(5) Since accidental introduction of the solution into a vein may occur during subcutaneous or intramuscular injections of novocain-adrenalin, the approximate intravenous lethal dose of this combination—that is, 0.019 gram per kilogram of body weight—should be borne in mind. However, the likelihood of injections by accident of a gram or more of novocain in one-half per cent solution intravenously must be considered remote owing to frequent changing of the position of the needle point.

"(6) As it is impossible to know beforehand of the existence of an idiosyncrasy the injection should always be very gradual and cautious. It is prudent to inject a few cubic centimeters of the customary one-half per cent solution and then wait for 10 or 15 minutes for the development of toxic phenomena, which usually appear promptly in individuals having the idiosyncrasy.

"(7) Novocain-adrenalin, when injected subcutaneously in the usual proportions and amounts may be regarded as practically safe except in individuals having the idiosyncrasy."—(E. H. H. O.)

HORSLEY, J. S. **Reversal of the circulation in the lower extremity.** Ann. Surg., March, 1916.

The results of two experiments made by Carrel and Guthrie in 1906 are quoted: "(*a*) The valves prevent, at first, the reversion of the circulation in the veins. (*b*) After a short time the valves gradually give way, and the red blood flows through the veins as far as the capillaries. (*c*) Finally it passes through the capillaries and the arteries are filled with dark blood. Probably dark blood also returns from the capillaries toward the heart through some veins. (*d*) Practically complete reversal of the circulation is established about three hours after the operation."

The author conducted a series of experiments on animals in 1914 to determine whether the arterial blood when switched from artery to vein reached the ultimate capillaries of the foot. This was done by uniting the cardiac end of the femoral artery to the distal end of the femoral vein. The animals were killed at different periods,

varying from a half hour to 46 days. Injections with a bismuth mixture were then made from a point just above the anastomosis, a roentgenogram taken, and then an injection made into the systematic circulation through the carotid, followed by another roentgenogram.

The conclusions reached at that time by Horsley he has recently substantiated in a dog killed 69 days after operation. The bismuth was found to pass only to a point halfway between the knee and ankle, and large anastomotic branches carried it back to the iliac vein. That injected into the systemic circulation passed on down into the foot, showing an increase of the collateral circulation after the femoral artery had been united to the vein.

The large valves in the veins are believed to first break down quickly. The arterial blood then rushes into the smaller veins; the valves here requiring more force to be overcome do not give way as readily. The experiments showed that the circulation went but little farther down the leg 69 days after operation, than it did in the first half hour. Collateral circulation quickly increases and large veins form which readily take care of the reversed blood. The communication between the artery and vein tends to close and was found to be very small after 69 days.

The beneficial results that are obtained from the reversal of the circulation in threatened gangrene are clearly due to the fact that obstruction of the venous circulation causes the arterial blood to remain in the tissues longer than it otherwise would. The same result can be obtained more accurately and with less danger by ligation of the femoral vein under local anesthetics. This procedure has been carried out by von Oppel, Coenen, Lilienthal, and others.—(E. H. H. O.)

HYGIENE AND SANITATION.

C. N. FISKE, Surgeon, and R. C. RANSDELL, Passed Assistant Surgeon, United States Navy.

CANNON, W. B., CRILE, G. W., ERLANGER, J., HENDERSON, Y., and MELTZER, S. J. **Report of committee on the resuscitation from mine gases.** Bur. Mines, Technical Paper 77, 1914.

CANNON, W. B., CRILE, G. W., HENDERSON, Y., MELTZER, S. J., SPITZKA, E. A., CONNELLY, A. E., THOMPSON, E., EGLIN, W. C. L., and WEAVER, W. D. **Report of commission on resuscitation from electric shock.** Nat. Elec. Light Assn., New York City.

The first commission was appointed by the Bureau of Mines, the second by the National Electric Light Association; both were made up of representative physiologists and engineers of the United States and recommended by the American Medical Association.

(1) *Simple asphyxiation.*—It is pointed out that in electric shock the nervous control of the respiratory muscles may be temporarily paralyzed; the heart continues for a few moments to pump blood through the body, but the heart soon stops beating effectively, owing to the lack of oxygen supply, and the action dies of asphyxia. The same result follows in drowning, and likewise in suffocation when carbon dioxid or methane or excess of nitrogen has replaced the oxygen of the atmosphere. In such cases artificial respiration in which the lungs are at once adequately supplied with ordinary air is sufficient treatment.

(2) *Carbon-monoxid poisoning.*—The harmful effects of very small percentages of carbon monoxid are emphasized. Thus if air containing only 0.1 per cent of CO be breathed continuously, it will, because of its great affinity, unite with about half the hemoglobin of the blood. If before death the subject be brought into an atmosphere free from CO the combination between this gas and the hemoglobin begins to break up and the separation is more rapid if pure oxygen is breathed. In spite of the elimination of CO, in a large percentage of cases the subject does not recover. He may die during the next few days or weeks, or may continue to live with impaired sight or disturbed mentality. These effects, however, according to available evidence, are in the main not due to a direct toxic action of CO but to deprivation of oxygen. It is of the utmost importance in every case therefore to supply the cells with oxygen as soon as possible on the chance that the critical period has not been reached. If the victim is breathing at approximately the normal rate, oxygen may be given very simply by fastening to the face of the victim a mask supplied with straps to hold it in place, fitted with an outlet valve opening to the air and an inlet valve connected to a breathing bag which is kept provided with oxygen from a cylinder or generator. If the victim is breathing slowly or irregularly or has ceased breathing he should be given the oxygen by a mechanical or manual method of artificial respiration.

(3) *Manual methods of artificial respiration.*—A critical examination of the Sylvester and Shäfer methods was made. The claims of Schäfer are as follows: (1) Greater simplicity and ease of performance; (2) absence of trouble from the tongue falling back and blocking the air passages; (3) little danger of injuring the liver or breaking the ribs if pressure be gradually, not roughly, applied; and (4) larger ventilation of the lungs. The last named was examined on conscious, healthy men and animals in a paralyzed state. The results indicated that so far as the amount of ventilation of the lungs is concerned the Schäfer or prone pressure method, reinforced by extension of the arms forward, is superior. This advantage, taken in conjunction with its greater simplicity and safety, has led the committee

to recommend the prone pressure method. Detailed directions for the proper technic of the method are given.

(4) *Mechanical devices for artificial respiration.*—Manual methods may be impracticable on account of trauma; the amount of lung ventilation may be, in apneic subjects, close to a dangerous minimum. For these reasons mechanical devices assuming more efficient respiration are desirable. The pulmotor and the Brat apparatus were examined; the lungmotor and salvator were not tested. The first two machines are alike in providing for inspiration by oxygen pressure and for expiration by suction. Elaborate experiments were made on curarized and anesthetized animals. The committee disapproved of both apparatus as unphysiological and not mechanically reliable, the principal reasons being that the automatic mechanism may be readily disturbed if the inspiratory blast meets any obstacle in the air passages; and that expiration is performed by suction. Normal expiration is mainly accomplished by the elastic recoil of the distended tissues. When air is sucked out the finer bronchioles and alveoli are liable to collapse and stick together so that the next inspiratory pressure which is barely sufficient to overcome the elasticity of the lung is not strong enough to overcome this additional resistance, so that serious damage may result.

(5) *The Meltzer apparatus.*—The committee recommends the apparatus of Dr. Meltzer because of its certain action, its freedom from sucking in expiration, and its lightness, cheapness, and simplicity. It is fully described and illustrated.—(E. W. BROWN.)

SEELHORST. **A contribution to the fly campaign.** München. med. Wchnschr., Feldärztliche Beilage, October 12, 1915.

Several ingenious contrivances are described which have been installed in the large German field hospitals to combat the fly nuisance. Every well-known method of extermination and prevention of breeding has failed to reduce materially their number, and the torment suffered by the helplessly wounded in the wards (aside from their danger as carriers of infection) calls for the most painstaking efforts to keep hospitals free of this pest. Screening with netting is partially effective, but cuts off ventilation, and it has been found that contrivances which set the air in motion are most effective. Large, what might be termed "flappers," made by covering a light wooden frame with some cheap material, are suspended at intervals from the roof, and these are swung by means of ropes in various ways. These have been particularly valuable in tent hospitals largely in use on the western front. Crude windmills, installed above the roofs, work a horizontal screw which operates a big, light fan below; similarly wind fans have been installed in

windows, and apertures cut in the walls. These are worked by hand flywheels. The author emphasizes the need of insisting, in a disciplinary sense, on a strict compliance on the part of every individual with well-known measures of cutting off food supply and breeding facilities of this most troublesome pest.—(P. J. WALDNER.)

HALBERKANN, J. **On protection against mosquitoes.** München med. Wchnschr., Feldärztliche Beilage, October 12, 1915.

Experiments by the author with tincture of pyrethrum roseum proved that odor, as such, does not unfavorably affect mosquitoes, in fact serves to attract them. He cites some experimentation by Mühlens and Giemsa with anointing materials, and these likewise were ineffective. He believes that protection against mosquitoes depends upon an agent which "gums up" their respiratory organs; this is achieved not by a gas, but only by a fluid medium. The author states that excellent results are obtained by using a $2\frac{1}{2}$ per cent solution of green soap (or $1\frac{1}{2}$ per cent soda soap) in soft water, combined with about 2 per cent of commercial formalin, used as a spray.—(P. J. WALDNER.)

COLBORNE, W. J. **Medical guard.** Jour. Roy. Nav. Med. Service, I, No. 4, October, 1915.

The uncertainties with which the "medical guard" is surrounded in our own fleets justify a full reprint rather than an abstract of this contribution to the new medical journal of the British Navy:

"The medical guard is a concession allowed by the Admiralty at the discretion of the senior naval officer of the fleet or squadron, and is not included in the King's Regulations. As very few instructions are laid down in local port orders, etc., with reference to this guard, I state below some details and what is the custom of the service with regard to it.

"(1) The medical guard is detailed each day, in some cases for the week, by the senior naval officer's ship of the squadron present. The medical officer of this ship is sometimes consulted, but not necessarily so, because, for convenience of boats, etc., the medical guard is generally given to the ship having the general guard duties.

"(2) The ship having the medical guard flies a distinctive flag, and that ship must have a medical officer on board available at all times for calls to other ships of the squadron; this squadron generally consists of four ships in a seagoing squadron. In a dockyard or home port the medical guard is generally detailed for a certain group of ships, or even a district.

"(3) The medical officer of the guard must answer all calls, whether they are to his own squadron or not.

"(4) The medical guard is taken for 24 hours, generally from 9 a. m. to 9 a. m.

"(5) Ships coaling should not be given this guard if it can be avoided; if it is so given, and two medical officers are borne, both must remain on board until the coaling is finished.

"(6) Ships should take the medical guard in rotation, regardless of the number of medical officers borne; i. e., with two ships present, one with one medical officer and the other with two, the ships take the guard day and day about.

"(7) The guard is kept by the junior medical officer of the ship unless the senior medical officer wishes to do so by mutual arrangement with his junior.

"(8) It is inadvisable to change the ship to which the medical guard has been given, if it can be avoided, after the signal has been made, as it upsets the rotation and interferes with the arrangements of the other medical officers of the squadron. If a change is really necessary it is better to ask another medical officer to take the guard for that day, in addition to his own for that week, and so avoid alteration of the rotation.

"(9) Ships having this guard should have two sick-berth ratings on board, if the number borne will permit, as a rating may be required to take a case to the hospital or to take charge of a case in a small ship which has no sick-berth rating on board.

"(10) When called to another ship, care should be taken to write full details of the case in the daybook, for the information of the medical officer of that ship on his return."—(C. N. F.)

WARNER, A. R. **The result of closing the segregated vice district upon the public health of Cleveland.** Cleveland Med. Jour., xv, No. 3, March, 1916.

The superintendent of Lakeside Hospital, situated near the old segregated district, caused to be recorded the individual source of each case of syphilis in men who were willing to give the information, both eight months prior to and eight months succeeding the closure of the district. Tabulation is made as follows:

Sources.	Before closing.	After closing.
Segregated district	45 cases, 40.2 per cent.	
Street walkers	29 cases, 25.9 per cent.	6 cases, 33.3 per cent
Clandestine prostitution	10 cases, 8.9 per cent.	2 cases, 11.1 per cent.
Accidental	14 cases, 12.4 per cent.	6 cases, 33.3 per cent.
"Friends"	11 cases, 9.8 per cent.	4 cases, 22.2 per cent.
Marital	3 cases, 2.6 per cent.	
	112 (+7) 99.8 per cent.	18 (+35) 99.9 per cent.

The interrogation point represents an unknown number of unlisted cases which failed to give full data, and after closing there were 35 unlisted cases. The addresses given were widely distributed throughout the city in both columns, so that proximity of dispensary to district could not have been an appreciable factor.

From the standpoint of public health, the closing of Cleveland's vice district was certainly wise.—(C. N. F.)

ROUTSONG, R. C. **Workshop education in hygiene.** Am. Jour. Pub. Health, vi, No. 2, February, 1916.

From experience at the works of the National Cash Register Co., Dayton, Ohio, Mr. Routsong outlines a comprehensive program for workshop education in hygiene. Prospective legislation sought by the Department of Labor which might greatly increase the responsibilities of medical officers at naval industrial establishments renders a consideration of the topics of this paper most timely and justifies quotations at length. He emphasizes the importance of training men (evidently not necessarily medical practitioners) for this work, and that they should give their entire time to it in order to attain the "faith and enthusiasm" essential. Assuming that the values of good housing and factory construction and good housekeeping are appreciated, he seeks an orderly scheme for teaching them "to be good housekeepers and good caretakers of their bodies."

The author postulates five fundamentals, every one of which is essential:

"(1) Suppression of infectious and contagious diseases, physical examination prior to employment, reexaminations, and consistent medical supervision.

"(2) Personal hygiene in relation to occupational diseases.

"(3) Personal hygiene in relation to diseases not related to duties but resulting in lost time and decreased efficiency.

"(4) Cooperation upon the part of employees to make the most of sanitary equipment and provisions made by the employer.

"(5) Lastly, it is not going too far afield to discuss with the workman the problems of home hygiene. These discussions should include food, its kind, preparation, and how it should be protected by the housewife and through community regulation; home sanitation, including such matters as cellars, heat, ventilation, and plumbing, sleeping arrangements, and the like. To neglect some of these things is to neglect one of the most important causes of physical inefficiency and breakdown, because the home life of the worker, together with his habits, do more to impair his efficiency than even the worst conditions in the average factory to-day. And, furthermore, the trend

of legislation seems to be toward sickness insurance for which the indemnity shall be paid jointly by employer, employee, and the State.

"A whole-time factory inspector should study the sanitary needs of each shop. A survey should be made of all departments for industrial health hazards, and the distribution of dispensary cases should be charted on a drawing of the plant. One or more whole-time physicians and visiting nurses will be required, the latter to conduct the practical home educational work with members of the employee's family and thereby cultivate 'personal relationship which is so essential to the success of the [welfare] movement.'"

"Bulletins are most important," conveying but one idea at a time but telling the story simply and quickly. Plant publications [and local newspapers] should contain health hints based upon local findings, and brief descriptions of communicable diseases should be capable of clear understanding. The weekly pay envelope may be utilized for propaganda. The National Cash Register Co. last year gave three illustrated health lectures to all employees on company time; particular attention should be devoted to the inefficiency resulting from intemperance and venereal diseases.

Much stress is laid upon educating and assuring cooperation from all officials down to and including job foremen before appealing to the employees at large, who look to those "higher up" to set the example.—(C. N. F.)

TROPICAL MEDICINE.

E. R. STITT, Medical Director, United States Navy.

HEISER, V. G. **Are there harmful and harmless hookworm infections?** Jour. Soc. Med., xvii, No. 1, February, 1916.

The first part of the question is of course readily answered in the affirmative by general experience in this country and in tropical regions abroad, and by the author from reduction of otherwise irreducible mortality at Bilibid prison from 80 down to 12 per thousand per annum through eradication of hookworm. In many districts, of the Philippines, however, such as Las Piñas, Tay Tay, and Tuguegarao, when 25,000 persons were examined and showed 12 per cent infected (as compared with 60 per cent infected at Bilibid), systematic treatment both for hookworm and other diseases found failed to make any impression on the death rate. Apparently hookworm infestation does not necessarily constitute a morbidity or mortality factor among large groups of people.

"Hookworm work in the Philippines, except in Bilibid prison, among arriving aliens, and patients in hospitals usually from other causes, has for the present been discontinued as a public-health

measure, because the money used in combating hookworm infection will produce greater results in other lines of endeavor." Further investigation is urged and reports invited on this subject to be sent to the International Health Commission, Rockefeller Foundation, 61 Broadway, New York, in order to serve as guide to the wise expenditure of public-health funds.—(C. N. FISKE.)

WILCOX, W. H. **Beriberi, with special reference to prophylaxis and treatment.** Lancet, London, March 11, 1916.

This paper is based on a study of 50 cases in British troops in the Mediterranean area. The author calls attention to the fact that the diet given in hospitals on campaign for such diseases as dysentery, diarrhea, paratyphoid, etc., is deficient in antiberiberi vitamines.

The cases observed were generally of the edematous type, starting in with weakness of the legs, shortness of breath, malaise and anorexia. Paresthesia was noted early.

In discussing the cause of the condition he notes quite concisely the vitamine side of the question, as follows:

"The antiberiberi vitamine is a nitrogenous substance. It is not a protein. It does not contain phosphorus. It is soluble in water and alcohol, or dilute acids. It is destroyed on heating to 130 C., but not at a temperature of 100 C., nor by dilute acids, though sterilization of foods undoubtedly destroys the vitamine. Tinned foods, owing to the heat employed in their sterilization, are almost entirely deficient in antiberiberi vitamine. This vitamine is more stable than the antiscurvy vitamine. Thus the latter is destroyed by heating to temperatures below 100 C., e. g., about 70 C. Also drying of fresh vegetables, or even the keeping of them for long periods, destroys the antiscorbutic vitamines.

"Yeast is a substance which is, perhaps, the richest in antiberiberi vitamine. Egg-yolk, brain, liver, kidneys, sweetbread, oatmeal, haricot beans, peas, are all fairly rich in this vitamine. Milk and fresh meat contain only small amounts."

Under differential diagnosis he discusses the frequent association of scurvy with beriberi, especially in cases occurring on board ship or on campaign when there is difficulty in the supply of fresh food. Some of the Dardanelles cases showed scorbutic symptoms, as purpura. In differential diagnosis of scurvy we should look for the following signs: "The purple, swollen gums with tendency to bleed. Purpuric patches on the skin. Anemia. Hemorrhage into the hard palate. Tenderness and swelling of bones due to subperiosteal hemorrhage. This condition is most often evident in the tibias, and then there is a good deal of firm edema of the skin around the affected

bone. Indeed, swelling of the legs may be very marked, but there is great local tenderness over the tibias and not in the calves. The above signs clearly distinguish scurvy from beriberi. In scurvy also multiple neuritis is absent. The effect of treatment often serves to distinguish the two diseases. Thus, while scurvy rapidly clears up if special antiscorbutic substances such as raw potatoes, lemons, fresh vegetables (uncooked) are given, beriberi requires a special dietary of a different nature."

In treatment of beriberi he particularly recommends yeast. "Two ounces of dried yeast, such as is supplied on campaign under the name of 'export yeast' should be administered daily. This is conveniently given by pouring on the yeast a little boiling milk, stirring up into a thin cream, and then adding more warm milk and sugar so that a palatable food results. * * *

"Articles of diet for beriberi cases, arranged in order as regards their vitamine value:

1. Yeast.
2. Eggs (either raw or lightly cooked).
3. Brain.
4. Liver.
5. Sweetbread.
6. Kidneys.
7. Heart muscle.
8. Peas.
9. Haricot beans.
10. Katjang idjoe beans.
11. Lentils.
12. Porridge.
13. Brown bread.
14. Milk (fresh, if possible).
15. Fish or meat.
16. Ordinary bread or biscuits.

"Lemon juice or lime juice should also be given."—(E. R. S.)

DEAN, H. R., and ADAMSON, R. S. **A method for the preparation of a nontoxic dysentery vaccine.** Brit. Med. Jour., April 29, 1916.

The authors note the susceptibility of the rabbit to injections of the Shiga dysentery bacillus; injection of one-twentieth of a loopful of an emulsion of the organism, when killed by heat at 58 C. for one hour, invariably killing the rabbit in from five to seven days. They note that bacillary antigens are not killed by hypochlorous-acid solutions and experimented on rabbits with emulsions of Shiga dysentery bacilli, first killed by heat and then treated with an equal volume of eusol for 24 hours. Such a measure enormously reduces or destroys the toxicity of the organism for rabbits.

In connection with the prophylaxis in man of this severe dysentery infection they suggest the following procedure: Prepare an emulsion containing 200 million bacilli per cubic centimeter. Heat for an hour at 58 or 60 C. Mix with an equal quantity of a 1 in 500 solution of freshly prepared eusol in normal saline. Allow mixture to stand at room temperature for 24 hours. Inject subcutaneously 1 c. c. of this mixture; 1 c. c. will contain 100 million bacilli

in a 1 in 1,000 dilution of eusol. The second dose might be given 10 days later. Prepare an emulsion containing 800 million in 1 c. c. Heat for one hour at 58 or 60 C. Mix with an equal quantity of 1 in 500 eusol. Allow to stand for 24 hours at room temperature and inject 1 c. c. A third dose of 200 million or more of bacilli, sterilized with heat but without the addition of eusol, may possibly be necessary to complete the production of a satisfactory immunity.

They state that as yet they have only made a limited number of trials of this vaccine on man.

NOTE.—Eusol has been used with marked success by Lorrain, Smith, Ritchie, and others in the treatment of the toxemia and septicemia of wounds in war. Its preparation is as follows: Put 27 grams chlorinated lime (bleaching powder) in a Winchester flask and cover with a liter of water. After thorough shaking add 27 grams of boric acid. After shaking the mixture it should stand for a few hours, and then be filtered through cotton wool. The clear solution is eusol. It must be kept in tightly closed bottles.—(E. R. S.)

PATHOLOGY, BACTERIOLOGY, AND ANIMAL PARASITOLOGY.

C. S. BUTLER, Surgeon, and R. H. LANING, Passed Assistant Surgeon, United States Navy.

BABCOCK, R. H. **Autogenous vaccines in the treatment of bronchitis and asthma.** Lancet-Clinic, February 12, 1915.

The author has obtained very good results in several cases of bronchitis and bronchial asthma where routine treament by expectorants, etc., has failed.

He used mixed vaccines composed of various organisms as they are found in individual cases. The bacillus of Friedländer, *Micrococcus catarrhalis*, an influenza-like bacillus, were found in the cases of bronchitis usually, and in the asthma cases, the anaerobic fusiform bacillus.

The laboratory work was carried out by Dr. E. C. Rosenow.—(G. F. CLARK.)

KOLMER, J. A., WOODY, S. S., and MOSHAGE, E. L. **The practical value of the guinea-pig test for the virulence of diphtheria bacilli.** Am. Jour. Dis. Child., April, 1916.

The writers report the results in a series of 1,054 cases examined. They found animal inoculation to be of great value, especially in the cases of "carriers," as to the duration of quarantine, etc.

The method of yielding best results was the subcutaneous injection of 250–300 gm. guinea-pigs with 4 c. c. of a suspension of diphtheria bacilli. Ten c. c. of normal salt solution were used to wash

off a good 24-hour culture of diphtheria bacilli from one tube of Loeffler's serum—4 c. c. of the suspension being used for an injection. Local edema and evidences of toxemia were regarded as indicating virulence even though the animals did not succumb in four days.

Granular and barred types of bacilli were found virulent in about 70 per cent of cultures; long, solid bacilli in about 42 per cent. Cultures of short. solid bacilli were found uniformly to possess no virulence.—(G. F. CLARK.)

ZINGHER, A. **Methods of using diphtheria toxin in the Schick test and of controlling the reaction.** Am. Jour. Dis. Child., April, 1916.

The author finds it desirable, in view of the great importance of the Schick test, to say a few words in regard to the toxin used in the test, the control, the technic, and, finally, about the interpretation of results.

As toxin rapidly (up to about one year) changes to toxoid it is imperative to have a properly ripened product. It is necessary to take steps to prevent deterioration even of this, and this is accomplished by refrigeration and darkness. The m. l. d. must be accurately defined, and one-fiftieth of this is given with a proper syringe intracutaneously. A description of how to standardize and dilute the toxin, how to prepare the control, and how to perform and interpret the test is given. Positive, negative, pseudo, and combined reactions are recognized.

The importance of the test is indicated by the fact that of 1,000 children admitted to the Willard Parker Hospital who gave negative reactions, not one developed diphtheria during their stay, though from 15–20 per cent showed the presence of virulent Loeffler bacilli in throat cultures while there. In the author's table 17–32 per cent of normal children between the ages from 2 to 16 gave positive results.

For more details, reference should be made to the original paper, the conclusions of which are:

1. The great practical value connected with the Schick test makes it desirable that the results obtained with it should be reliable.

2. The accuracy of the results will depend not only on the toxin, but also the care with which the test is made, and on the interpretation of the reaction.

3. The undiluted toxin is available in bulk or in capillary tubes. It should be well ripened and always kept very cold and in a dark place.

4. The positive reaction should be considered as indicating a lack of immunity, unless the pseudo-reaction can be eliminated by a control test. The negative reaction is a definite sign of immunity.

5. It is important to remember that, in using diphtheria toxin in the Schick test, we are dealing with an accurate quantitative reaction, and handling carefully measured amounts of an active agent, that has a tendency to deteriorate, even in bulk, if it is not properly protected from light and exposure, and kept in a very cool place.

6. The results with the test obtained in 2,700 normal children, show that from 17 to 32 per cent, between the ages of 2 and 16 years, give a positive reaction and are probably susceptible to diphtheria.—(C. S. B.)

McClure, C. W., and Lott, E. G. **Results with cholesterinized antigens in non-syphilitic sera.** Am. Jour. Med. Sc., May, 1916.

In view of the differing opinions of authorities as to the value of cholesterinized antigens in the Wassermann reaction the authors have compared the results of alcoholic extracts plain and the same cholesterinized upon the same series of 658 sera. Negative cases were used generally, only enough positive sera being used to show the value of the experimental antigen.

Technical and diagnostic errors were carefully guarded against throughout and the conclusions drawn that results obtained with cholesterinized antigens must be slightly guarded, and that cholesterin additions in the amounts employed by the authors render alcoholic extracts more sensitive but somewhat less specific and therefore of questionable value in the diagnosis of syphilis.—(C. S. B.)

Levy, R. L., and Rowntree, L. G. **On the toxicity of various commercial preparations of emetin hydrochlorid.** Arch. Int. Med., March 15, 1916.

In view of the more extended use of emetin in oral and intestinal amebiases a more exact knowledge of the toxicity of the commercial preparations is desirable. Two human cases of the toxic effect of emetin, one of which was fatal, are recounted, and an extended series of experiments upon animals given. Dogs, cats, and rabbits were used in the study of five commercial preparations of the drug, which were studied with a view to the following points: (1) Toxicity, (2) effects on the circulation and respiration, (3) pathological changes, (4) effect on the coagulation of blood, (5) effect on renal function and the development of acidosis.

A summary of previous experimental work with emetin and of the ill effects of its clinical use are given.

The authors offer the following suggestions with regard to a rational emetin therapy:

1. The administration of emetin hydrochlorid is not to be regarded as a harmless procedure. Even in therapeutic doses ill effects may follow its use.

2. Individualization by close clinical observation is essential both for the success and safety of the treatment. Patients may differ markedly in their susceptibility to the drug, and the various commercial preparations vary widely in toxicity. These points are strikingly demonstrated by the toxicity experiments herein reported.

3. The treatment should be given in courses, at intervals of several days or a week. The subcutaneous route is the one of choice. Individual dosage and the duration of each course must be determined by the exigencies of the case. One-third grain three times a day for a week or 10 days is usually a safe dosage in amebic infections. It is rarely necessary to give more than 1½ grains daily. In the treatment of pyorrhea, Bass and Johns advocate one-half grain daily for from three to six days, and maintain that no case need have more than six days' treatment. Under ordinary circumstances this seems well within the margin of safety. It must be borne in mind, however, that the administration of even relatively small doses over a long period may prove harmful.

4. The large dosage advocated by Baermann and Heinemann is unnecessary and dangerous.

5. Intravenous injections should be employed only in extreme cases. If this mode of administration seems imperative, small doses, well diluted (one-half grain in 100 c. c. salt solution) should be slowly given, and the blood pressure should be carefully observed during the injection.—(C. S. B.)

KOLMER, J. A., and SMITH, A. J. **Bactericidal and protozoacidal activity of emetin hydrochlorid in vitro. Bactericidal and protozoacidal activity of emetin hydrochlorid in vivo.** Jour. Infect. Dis., March, 1916.

The conclusions which the authors reach in these two articles are as follows:

"Emetin hydrochlorid possesses bactericidal properties, but prolonged contact with bacteria is required before this action becomes apparent. A 5 per cent solution of emetin failed to kill *B. typhosus* in 15 minutes, but with a special technic, in which the drug remains in contact with the test microorganisms, emetin proved about equal to, or even on occasion five times more antiseptic and germicidal than corresponding dilutions of pure phenol.

"The bactericidal activity of emetin is more apparent in fluid than it is in solid culture media.

"In an emulsion of pus and various bacteria from pyorrhea alveolaris a 2 per cent solution of emetin required 45 minutes to effect sterilization, whereas a corresponding dilution of phenol proved germicidal in 5 minutes or less; a 0.5 per cent solution of emetin required

$1\frac{1}{2}$ hours, and a corresponding dilution of phenol, 45 minutes to sterilize the emulsion.

"Emetin hydrochlorid possesses trypanocidal properties in vitro, but this action is probably less vigorous than is its amebacidal action.

"Emetin is highly amebacidal, producing a marked structural change in *Endameba gingivalis* when applied in direct contact, even in high dilution.

"Emetin hydrochlorid probably exerts some bactericidal action when applied locally in the treatment of pyorrhea alveolaris; but its bactericidal activity must be entirely secondary in importance to its amebacidal action, in view of the beneficial results and the disappearance of amebas following the hypodermatic use of the drug in the treatment of pyorrhea alveolaris and amebic dysentery when the drug is highly diluted in the body fluids.

"In view, however, of the probable bactericidal value of emetin when applied locally it would appear that the logical treatment of pyorrhea alveolaris should consist primarily in its local application combined with hypodermatic administration, especially in severe infections or in those accompanied by systemic complications."

The conclusions reached in the in vivo experiments are as follows:

"Emetin hydrochlorid administered intravenously to rabbits in doses varying from 0.065 gm. to 0.52 gm. (1 to 8 grains) per 132 pounds of body weight exerted slight or no antiseptic or germicidal influence on a virulent culture of *Staphylococcus aureus;* abscesses developed in the internal organs of the majority of the experimental animals.

"Emetin hydrochlorid administered intraperitoneally to mice in doses varying from 0.065 to 0.52 gm. and 0.975 gm. (1 to 8 and 15 grains) per 132 pounds of body weight exerted no appreciable inhibitory or germicidal action on anthrax and tetanus bacilli.

"Emetin hydrochlorid administered intravenously to white rats, infected 24 hours previously by intraperitoneal injection with *T. equiperdum* and *T. lewisi*, in doses varying from 0.065 to 0.78 gm. (1 to 12 grains) per 132 pounds of body weight, appeared to exert a slight trypanocidal influence, which was most apparent in the experiments on *T. equiperdum.*

"Emetin hydrochlorid is highly and specifically amebacidal in vivo, and its curative effects in amebic infections is to be attributed practically solely to this action. While the drug has slight bactericidal powers in vitro under the conditions of prolonged contact with microorganisms, and while this germicidal action may enhance the value of emetin in the treatment of amebic infections by local application, in the light of our experiments this bactericidal action is not in evidence in vivo.

"These observations constitute additional evidence of the active rôle played by *Endameba gingivalis* Gros in the pathogenesis of pyorrhea alveolaris; improvement or cure of this disease with emetin by subcutaneous injection is to be attributed solely to its amebacidal action. In the treatment with local applications of the drug the beneficial results are to be ascribed in most part to this same influence, although here there is reason to believe that the beneficial effects are, to some degree at least, due to a coincident bactericidal influence on the part of the drug."—(R. H. L.)

LOW, G. C. **Two chronic amebic dysentery carriers treated by emetin, with some remarks on the treatment of Lamblia, Blastocystis, and E. coli infections.** Jour. Trop. Med., February 1, 1916.

The author gives the results in the treatment of two cases infected with *Endameba histolytica*, *Lamblia intestinalis*, and *Blastocystis hominis*. The treatment was carefully controlled, with frequent stool examinations by well-recognized authorities. One-grain doses of emetin once daily were given for the endamebic infection, and beta-naphthol in 9 and 20 grain doses and methylene blue in 3 grain doses t. i. d. were tried for the lamblia and blastocystis infections.

"The behavior of the two cases to emetin is thus very interesting. In the first the drug caused a rapid disappearance of the cysts, with no return for over seven months, while in the second it seemed to have little or no influence upon them at first. There was, however, it is true, some slight reduction in the numbers, but no complete disappearance until toward the end of the course. Why the first case should have succeeded so quickly while the other resisted so strongly is not easy to explain, but it shows that one must persist with the drug in large doses. In such cases one-third or one-sixth grain doses would probably have had no effect at all. It is too early to say whether the disappearance of the cysts in Mr. S.'s case is a permanent one or not; examinations over long periods alone will show this. In some cases other observers have noted that cysts have reappeared after fair courses of emetin, so the infection is manifestly a very difficult one to get rid of entirely. Still, with one definite success and another apparently so, it is clearly one's duty to give a proper course of emetin in all such cases, the results being carefully controlled by microscopical examinations of the stools."

There was not much success with the use of beta-naphthol in the treatment of lamblia and blastocystis. Methylene blue acted well against lamblia, but had to be discontinued on account of poisoning symptoms.—(R. H. L.)

CHEMISTRY AND PHARMACY.

E. W. Brown, Passed Assistant Surgeon, and O. G. Ruge, Chief Pharmacist, United States Navy.

Howland, J., and Marriott, W. M. **A discussion of acidosis, with special reference to that occurring in diseases of children.** Bull. Johns Hopkins Hosp., March, 1916.

In this article the authors bring out several points of interest. They liken acetonuria to fever; stating that acetone appears in the urine of children with infectious diseases with much the same regularity that fever does. As hyperpyrexia may develop and in itself be dangerous or fatal, so a production of acetone bodies may in itself determine a fatal outcome. The quantitative difference between the mere presence of the acetone bodies and their production in amount sufficient to threaten life is an enormous one. Certain forms of diet will cause the production of several grams of beta-oxybutyric acid in 24 hours.

The mechanism for the regulation of the reaction of body fluids is discussed. They state that the constituents of the blood so far as the regulation of the reaction is concerned are: (*a*) Sodium bicarbonate, occuring both in the plasma and in the cells; (*b*) the acid and alkaline phosphates of sodium and potassium, found almost entirely within the red blood cells; and (*c*) the proteins. The body possesses a further means of defense in that it is able to neutralize acid by the production of ammonia. This is formed at the expense of urea, a neutral substance and represents a clear gain of alkali to the body.

They go on to state that from the foregoing it is plain that it is difficult to set a limit and say when acidosis is present, that it is even more difficult than to say when fever is present, because we recognize acidosis largely by the exhibition of increased activity in those defenses that are constantly in operation. The means by which it is recognized are various. The examination of the urine or the blood for the presence of abnormal acids is one. These abnormal acids when found are evidences of an alteration in the ordinary metabolism, but their mere presence does not indicate that acidosis is present, for they may be compensated for by the various means enumerated.

Another method is the determination of the amount of ammonia excreted in the urine and its relation to the total nitrogen output. This, however, can not be taken as conclusive evidence. Still another method is to determine by other means than by mere observation the evidences of increased pulmonary ventilation. This may be done by spirometer measurements or by the determination of the carbon dioxid percentage of the alveolar air. The carbon dioxid percentage, or more correctly, tension of the blood and of the alveolar air is the

same. The tension is diminished in acidosis. Another method is that of van Slyke to determine the bicarbonate content in the plasma by the amount of carbon dioxid given off when acid is added. Still another method is that of Sellards of determining the amount of bicarbonate depletion of the blood by ascertaining how much sodium bicarbonate by mouth is required to render the urine alkaline.

The above are only a few of the points taken up in this article.—(R. H. L.)

TILLMANS, J., and MILDNER, H. **Testing distilled water as regards its suitability for the preparation of salvarsan solutions.** Ztschr. f. anal. Chem., 1915, 28. 469–494.

The distilled water used for preparing salvarsan solutions for injections should be free from large numbers of bacteria, soluble constituents of glass, and heavy metals. The presence of a large number of bacteria in the water is usually indicated by a high oxygen absorption (from permanganate) and the presence of ammonia and the nitrous acid, and estimation of these will form evidence of the suitability of the water, apart from an actual bacteriological analysis. One hundred c. c. of the water when boiled with N/100 permanganate solution in the presence of dilute sulphuric acid should not reduce more than 0.2 c. c. of the permanganate solution; ammonia and nitrous acid should not be present. Provided that the distilled water is not contaminated by tap water, as is shown by the absence of chlorin, nitric acid, and calcium, the presence of soluble constituents of glass is indicated by the appearance of a red coloration where the boiled water is treated with a few drops of rosolic-acid solution. The presence of traces of iron in the water is not of importance; tin is not dissolved by distilled water, but tests should be applied for the detection of lead, copper, nickel, and zinc.—(E. W. B.)

BEAM, W., and FREAK, G. A. **Improved hemin test for blood.** Biochem. Jour., 1915, 9, 161–170.

The following test is very sensitive, even with bloodstains 12 years old, and with blood heated at 110 C. or mixed with earth or iron rust. A small quantity of the suspected material is placed in a tube, a few millimeters in diameter and about 35 mm. in length. A few drops of acetic acid containing from 0.01 to 0.1 per cent of sodium chlorid are added, and a very fine cotton thread is inserted in the tube, so that its upper end is near the top of the tube and the lower end reaches to the bottom of the liquid. The thread should be in contact with the side of the tube, to which it readily adheres when moistened with a drop of the liquid. The tube is then placed in a

vertical position and hemin crystals usually appear near the top of the thread within about one hour; they gradually increase in size, and, after some hours can be seen with a good hand lens. There is no advantage in substituting other salts for the sodium chlorid, and even the latter is not necessary when dealing with unwashed blood-stains.—(E. W. B.)

CRAMER, W. **Cause and significance of an abnormal reaction obtained in testing urine for sugar with Fehling's solution.** Biochem. Jour., 1915, 9, 71–77.

A sample of urine, containing about 1.5 per cent of dextrose, yielded a scarlet transparent solution when heated to boiling and then mixed with an equal volume of hot, diluted Fehling's solution. After some time the mixture darkened and deposited a black precipitate of extremely finely divided metallic copper. This reduction of cupric salts to metallic copper can be brought about by concentrated aqueous solutions of reducing sugars, provided that the latter are present in excess of the amount necessary to reduce all the cupric salt. It takes place even more readily when the reducing sugar is present in a urine of normal concentration as regards the usual urinary constituents and is facilitated by the fact that some of the constituents (creatinin) of normal urine are capable of holding cuprous oxid in solution. The reaction, when it takes place, indicates marked glycosuria unaccompanied by polyuria and not typical diabetes mellitus.—(E. W. B.)

CRAMER, W. **New test for reducing sugars in urine.** Biochem. Jour., 1915, 9, 156–160.

The test depends upon the reduction of mercuric oxid in slightly alkaline solution to metallic mercury. The degree of alkalinity is important, as the test becomes more sensitive but less specific the greater the alkalinity. The reagent is prepared by dissolving 0.4 gm. of mercuric oxid and 6 gm. of potassium iodid in 100 c. c. of water, and adjusting the alkalinity of the solution by the addition of N/10 alkali or acid solution, until 10 c.c. of the reagent require exactly 2.5 c. c. N/10 acid for neutralization, using phenolphthalein as the indicator. To apply the test 3 c. c. of the reagent are heated in a test tube to boiling, 0.3 c. c. of the urine is added, and the mixture again boiled and, after the lapse of 30 seconds, acidified with acetic acid. The latter dissolves precipitated phosphates, which obscure the reaction. Normal urine containing the usual quantity (0.1 to 0.2 per cent) of dextrose yields a very slight turbidity; when the sugar content increases to 0.5 per cent a distinct turbidity is produced. If the

alkalinity of the reagent is increased beyond the degree stated above, the normal quantity of sugar in urine then interferes by producing a turbidity; very strongly alkaline mercuric-oxid solutions are also reduced by such substances as creatinin and even by glycerol.—(E. W. B.)

FROST, W. D. **Rapid method of counting bacteria in milk.** Science, New York, 1915, 42, No. 1077.

About 0.1 c.c. of the milk is mixed with standard agar and spread over a definite area on a sterile glass slide, which (as soon as the agar is set) is incubated for six hours under conditions which prevent evaporation. It is then dried, stained, decolorized, and cleared, and the colonies counted under the microscope. The results thus obtained do not show greater variations than those given by standard methods. In the case of recently pasteurized milks a longer incubating period (e. g., eight hours) may be necessary.—(E. W. B.)

FREDERICK, R. C. **Estimation of carbon dioxid in air by Haldane's apparatus.** Jour. Soc. Chem. Ind., 1916, 35, 96–99.

For the estimation of small quantities of carbon dioxid in air Haldane's apparatus is the most convenient, and in skilled hands it gives sufficiently accurate results. The carbon dioxid of the air sample is absorbed by caustic potash and the consequent diminution in volume, measured on a graduated scale, gives a direct reading of the quantity of carbon dioxid in 10,000 parts of air. The author employs a potash solution of 10 per cent strength, colored with methyl orange. The apparatus is fully described and illustrated, and complete details are given for its correct manipulation. A more definite reading may be obtained by placing a sheet of black material behind the tubes on which the adjustment marks are situated. Instead of agitating the water jacket by blowing air through the water by mouth a rubber bulb is preferably supplied for the purpose. Thin pipe cleaners, which can pass right through the stopcocks, serve admirably for dislodging dirt from the glass tubes and air burette, which must be perfectly clean. The simplest operation is when the air to be analyzed can be taken directly into the instrument. For analysis at a distance small sample bottles of special pattern are required. The method of collecting the samples and discharging the contents of the bottles into the Haldane apparatus, with the assistance of a mercury bath, is described. Certain modifications have been introduced in the details of the apparatus, notably a device for extending the range of the instrument designed to register up to 100 parts of

CO_2 per 10,000, so that it can be used to read up to 500 parts per 10,000 by the temporary attachment of a special scale. Another adjunct described relates to a counterbalanced device to reduce the physical effort in raising and lowering the mercury reservoir of the apparatus when several analyses have to be performed. Stops are also provided which render it impossible for the mercury to run over into the potash vessel and vice versa.—(E. W. B.)

EYE, EAR, NOSE, AND THROAT.

E. J. GROW, Surgeon, and G. B. TRIBLE, Passed Assistant Surgeon, United States Navy.

SCHERER, A. **Researches upon the requisite visual acuity and refraction of infantry.** Ztschr. f. Augenheilk., September, 1911.

This paper first considers the regulations of the various European states regarding vision in the armies. The usual minimum corrected vision appears to be about 6/12 in one eye, which in some cases may be either eye, but in Switzerland must be the right. The English regulations are not mentioned, but we believe that 6/24 uncorrected vision is accepted and that glasses are not worn. All continental armies permit the use of spectacles, but the regulations are stricter with regard to cylinders, because such spectacles are difficult to replace when broken.

The author finds, as the result of certain experiments he made, that no acuity under 0.1 is of much value at the distances at which modern battles are fought. But as these experiments were made with individuals rendered artificially myopic with lenses, they have little value. A myope of 2.5 D., with an uncorrected acuity of 6/60 only, is hardly handicapped at all in his perception of the nature of a countryside, a matter on which we speak from personal experience. One with 6/12 vision would be perfectly capable of most of the duties of a soldier. An artificial myope of 2.5 D. would be in a very different position.

The astonishing fact is noted that soldiers who wear spectacles shoot better than those who do not in the proportion of 64 to 61.2. This is due to their superior intelligence. Scherer suggests that, on a campaign, spectacles consisting of a disk perforated with holes should be carried by the soldiers to replace broken spectacles. Such an apparatus gives good acuity and is not clouded by rain nor easily broken.

Visual acuity has an important relation to the quality of marksmanship, but many men of poor vision shoot well at a target.—(E. J. G.)

HAWLEY, C. W. **Autointoxication and eye diseases.** Ophthalmology, July, 1914.

The author believes strongly that autointoxication explains many cases of eye strain and eye disease for which it is difficult to assign a cause. The evidences of autointoxication on which he bases a diagnosis are chiefly the urinary reactions for indican, skatol, etc., and for excessive acidity. He quotes cases of eye strain, iritis, and cyclitis, in which attention to diet and flushing out of the lower bowel have produced favorable results.—(E. J. G.)

DUEL, A. B. **Orientation and equilibration.** New York Med. Jour., cIII, No. 13.

Purkinje, while discovering some of the laws governing rotation, attributed the phenomena to stimulation of structures outside the labyrinth, but Flourens, experimenting with the labyrinths of pigeons, demonstrated that the semicircular canals were connected with movements of the head.

In 1870 Ewald discovered that extirpation of the labyrinth in pigeons caused muscular weakness and uncertainty of movement and completely abolished the power of flight. Later experiments confirmed these early investigations and have proved further that the vestibular apparatus is a special sense organ, solely concerned with orientation and equilibration, and that its physiological connection with the auditory apparatus is overshadowed by its connection with the sight, the muscle-joint (kinesthetic), and the sense of touch.

Position is determined by various devices, simple tentacles in the lowest form of life, then calcareous particles suspended and acted upon by gravity, then a specially formed cavity filled with fluid in which is suspended the otolith. As development progresses this mechanism is duplicated; in organisms requiring movement in circles or curves there is a system of canals arranged in curves or segments of a circle, and occupying positions at right angles to each other.

In the highest orders other special senses enter into the determination of position and equilibrium—the eyes, the muscle-joint sense, and the tactile sense.

The conception of position is the result of the perfect cooperation of these senses, but the vestibular apparatus is the most essential factor. The dogfish when deprived of his vestibular apparatus attempts to swim, but is indifferent as to his position, whether on his back, side, or belly; a pigeon deprived of its vestibular apparatus learns to walk and hop, but not to fly; a dog deprived of his labyrinth regains the power to walk, run, and jump, but sinks if placed in a tank of water, while normally he swims when thrown in water over his head.

In the human subject the compensating factors are more important, and after destruction of a vestibular apparatus the individual later regains the ability to perform ordinary acts easily. But perfect orientation requires angulation. Impressions must come from two different vestibular apparatus at the same time, and it can be shown that he can not perform the more difficult acts of equilibration.

The optical illusion experienced while sitting in a train in a station, that the train is moving when actually a train on another track is moving out or in is familiar to all. This optical illusion can be corrected by a normal individual, either by looking at an upright portion of his own car that is not moving or by closing the eyes. When the eyes are closed the illusion is corrected by the special sense organ, the labyrinth. A congenital deaf-mute (i. e., one having no static labyrinth) having this illusion would have to correct it by the sense of sight.

An aviator who had no static labyrinth and who might guide his aeroplane with perfect precision while he still had objects on earth in view might suddenly lose all knowledge of position if he were enveloped in a cloud.—(G. B. T.)

ROBERTS, S. E. **Deafness due to syphilis.** Jour. Missouri Med. Assn., xiii, No. 4.

Paracutic deafness is that form in which the patient is able to hear ordinary conversation best when in a noisy place. This form of deafness comes on gradually, is bilateral, and usually more pronounced in one ear than the other. The functional tests and history do not vary greatly from the so-called chronic catarrhal middle-ear deafness, and this series is analogous to otosclerosis.

Paracutic deafness usually begins between the ages of 15 and 30; comes on gradually, and the patient complains of a high-pitched tinnitus. In this series of cases, 80 to 85 per cent are syphilitic, nearly all congenital.

The diagnostic points are: (1) History of gradual loss of hearing with paracusis, and without suppuration; (2) negative or relatively negative Gellé; (3) positive Wassermann and gold chlorid from the spinal fluid. The pathology of this condition is believed to be a syphilitic periostitis or ostitis in the capsule of the labyrinth.—(G. B. T.)

SCHEPPEGRELL, W. **Hay-fever: Its cause and prevention.** Jour. Am. Med. Assn., lxvi, No. 10.

Hay-fever probably affects 1 per cent of the population of the United States, and is far more prevalent here than in Europe.

The autumnal type is more common in the United States, while the spring type prevails in Europe.

Diagnosis.—The beginning of the attacks are coincident with the pollination period of certain plants, and in doubtful cases the staminate flowers of the suspected plant should be placed in a small sterile gauze bag and this gently snuffed by the patient. In susceptible patients a reaction quickly follows. The danger of this procedure is the development in an acute form of a latent pollinosis.

Etiology.—The plants most frequently producing hay-fever are the common and giant ragweed, and these may be taken as a type of wind-borne pollen plants.

Treatment.—Pollantin, gradual immunization with the specific pollen inhalation, serum, and vaccine therapy, have all been used, but with generally unsatisfactory or merely temporarily successful results. The removal of patients from pollens by sea voyages, etc., is effective, but is not available to the majority of patients. Operations for nasal obstructions, unless indicated for other reasons, have been successful in comparatively few cases.

Prevention.—The eradication of the hay-fever producing weeds will produce direct results, as was shown in New Orleans in September, 1915, when a storm destroyed practically all the leaves and flowers of the giant ragweed. As a result of this and the efforts of the Hay-Fever Prevention Association, fall hay-fever practically disappeared from New Orleans several weeks earlier than the usual time.—(G. B. T.)

DUPUY, H. **A study of five hundred tonsil enucleations with the Beck-Pierce tonsillectome.** South. Med. Jour., ix, No. 5, May, 1916.

Technic.—First lifting the tonsil upward into the supratonsillar region, push the tonsil through the ring. Keeping the index finger on the inverted tonsil, the wire loop is slowly drawn. Grasp the tonsil with a tenaculum. The tonsil is then gradually squeezed out of its bed, and only a thin layer of the capsule adheres to the tonsil.

Hemorrhage was notably less than with any other method and the reaction following operation less than in any other method except the Sluder.

Advantages claimed for this operation—the Sluder modification with the Beck-Pierce tonsillectome—are: Enucleation is quickly performed with simple instruments, and if the loop is drawn through slowly hemorrhage is markedly reduced. The ideal method should leave some of the so-called lining in the fossa and should not produce extensive reaction with consequent production of cicatricial tissue.—(G. B. T.)

REPORTS.

SANITATION OF AMERICAN SAMOA.[1]

By E. G. PARKER, Surgeon, United States Navy.

The rat problem here is a difficult one, since the entire island, all plantations, and the bush harbor innumerable rats. Their trapping is not easy, since the native food products, coconuts, etc., furnish abundant food for the pests, and they will not be attracted by the ordinary baits. Their arboreal habits also increase the difficulty. The island government now offers a bounty of 2½ cents each for rats. This has yielded only fair results in Tutuila, some 164 rats having been destroyed in the month of December. In Manua, however, the results have been splendid; 19,834 rats were destroyed during December, 1915. These rats were all caught without the aid of a single white man's rat trap. Native devices, in the form of snares made with coconut fiber, alone were used. The value of this rat extermination in Manua is obvious, since, in view of the recent famine there and the present vital necessity of preserving all food products, the destruction of rats is imperative. The results of the rat campaign in Manua will be published in Tutuila, and the natives and others enjoined to at least rival their neighbors. In addition to the bounty offered, the protection of owls as a natural rat enemy has been urged. The Samoan believes that the owl's only function is to destroy chickens; he therefore delights in killing them. It has been explained to the natives that the owl will kill 20 rats to 1 chicken. I believe now the owl is regarded in a more favorable light and his importance as a rat enemy realized.

As to the estimation of the rat population of these islands, all rules applicable elsewhere fail. Throughout the civilized world the well-proved standard of one rat to each human being is everywhere accepted as most reliable. The three islands of the Manua group, with their population of 2,000 souls, have yielded in one month a catch of nearly 20,000 rats. The futility of applying the standard used elsewhere is obvious. From our knowledge gained in the rat campaign as thus far carried out an estimate of, say, 30 rats to each human being is reasonable. The campaign will be vigorously pushed, and even better results are soon to be hoped for.

[1] From Annual Sanitary Report, Jan. 1, 1916.

CARE OF SAMOAN SICK.—The Samoan Hospital is now a permanent institution, established along substantial lines, and is of great benefit to the natives. This is now thoroughly appreciated by all natives, and by its systematic work the prejudice formerly existing among the natives that a hospital was to be regarded as a place in which to die, and was only for desperate illnesses, has been largely overcome. Now the institution is regarded rather as a place in which to get well. As evidence of this there has been an increase in obstetrical work in the institution. Formerly the Samoans would under no circumstances allow obstetrical work to be done by any other than their native midwives. As a result, many lives were needlessly sacrificed by postpartum hemorrhage, puerperal infection, and obstetrical accidents, the treatment of which, under proper conditions, is so very satisfactory and universally beneficial. One also sees in this institution other inherent prejudices overcome. Some years ago the terror with which the native regarded general anesthesia was a serious obstacle to the medical officer in the performance of urgent surgery. By dint of careful and painstaking education and by the opportunity granted all natives of witnessing capital operations at the Samoan Hospital, this prejudice has been overcome. In fact, it often becomes a point of argument with some natives now to avoid using a general anesthetic where local anesthesia is indicated.

All babies and female patients are cared for by the Nurse Corps and the native pupils in the training school for nurses. Many diseases of childhood are treated here and instruction given the natives in infant feeding, and the treatment of cases of malnutrition will be of everlasting benefit to the Samoan race.

HYGIENE AND SANITATION.—During the year 1915 the general health of the Samoans has been fair.

An epidemic of whooping cough, imported from Upolu, claimed many victims among the infants and children. The disease first appeared in Leone and rapidly spread from village to village, so that the entire island became involved. Attempts at isolation were made and instruction sent broadcast through the island as to the best methods of quarantine and control of the spread. At the same time requests were made of all village chiefs that they report each case to the health authorities. In consequence of the frequent communication between this island and Manua the disease was carried there. It spread rapidly and no village escaped. Attempts at isolation and quarantine were of some avail, but the native manner of living, the arrangement of their villages and dwellings, made efficient quarantine difficult if not impossible. Several deaths among the infants from the usual bronchial and gastro-enteric secondary complications occurred. All cases seemed to be aggravated by the dry, unseasonable weather, of which there has been an unusual

amount this year. A few days of moist, warm, real Samoan weather would always make a change for the better among all cases. Several trips to outlying villages where the disease was most prevalent were made by the medical officers. Conditions were looked into, treatment given, and isolation methods suggested.

From contact with native nurses nearly all the children on the naval station were affected with more or less serious attacks.

While the dry weather lasted all cases appeared most intractable. The disease manifested itself symptomatically among the natives about as it does among the white people at home. Perhaps on the whole the attacks were less severe and of shorter duration, yet 5 to 20 weeks should be regarded as the extremes of time necessary for recovery.

THE HURRICANE.—On the night of January 10 and 11, 1915, American Samoa was visited by a hurricane, the most disastrous so far as the Manua group is concerned that has occurred within the memory of man.

The damage on Tutuila was represented by the unroofing of several houses on the naval station and damage to coconut trees and other food products in varying degrees.

Manua, however, which lay apparently in the storm's center, was completely devastated, the five villages were literally wiped out, and practically all food products were destroyed, so that famine ensued. Not one habitation or other building remained standing in the entire group. All bananas and taro were destroyed, thousands of coconut trees were uprooted, and when first visited these islands, formerly so luxuriantly overgrown with tropical vegetation, showed not a single patch of green throughout their entire landscape. Practically all village boats were destroyed or smashed to bits and the fragments blown to sea. The casualties were surprisingly few, three only in number. This is explained by the fact that all concrete buildings, with corrugated-iron roofs, were the first to collapse, while the native houses, with their thatched roofs, still afforded protection. The thatched roofs after the supports had been carried away and the roofs were flat on the ground, still afforded life-saving shelter from flying corrugated-iron roofing, coconuts, and other débris.

One month after the storm, there being a serious food shortage, famine threatening in fact, a party set out from Manua in a small, open, pulling boat. They arrived in Tutuila after a pull of 30 hours, bringing the first news of the calamity. The U. S. S. *Princeton* was immediately dispatched with provisions, and conditions in Manua were found even worse than the relief party had described. The senior medical officer accompanied this expedition and made a thorough inspection of each island of the group and all

village sites. The destruction on all hands was appalling. A detailed report was given the governor and relief work begun at once. Congress appropriated $10,000 and the American Red Cross Society $2,000.

Frequent trips to Manua were made in the U. S. S. *Princeton*, carrying provisions and other necessities. These provisions were apportioned out to the several villages in accordance with the population and needs. Frequent sanitary inspections were made and rigid rules laid down to prevent pestilence being added to the calamity. This was most essential since, after the storm, came a most unusual pest of flies and the opportunities for disease transmission by this means were ideal. Orders were issued that the men should at once repair to the bush and start their plantations on extended scale while the women should clean away the débris in the villages. Native food products for planting were sent from Tutuila. Under careful and continuous supervision of the work the plantations were well laid out and started; the natives now seeing that their food products were thriving, began to take heart and worked hopefully.

About four months after the plantations were started and all was going well, with bright prospects, there occurred a most disheartening setback. The taro plantations, well advanced and with every prospect of a good yield of this most essential food product, were attacked by cutworms and nearly destroyed. All the labor which had been spent in this direction was now brought to naught. Even should we be able to control the worm, and taro be replanted at once, there were still eight months before the product would be available for food. The situation was most discouraging. As the supply of provisions furnished by the Government was not inexhaustible, the problem was to bridge over the eight months until the taro might be expected. Orders were issued that every available man, woman, and child should repair at once to the taro plantations and destroy these worms by actual hand picking. This was done, and the infection was gotten under control.

The Hawaiian Agricultural Experimental Station at Honolulu was cabled and the next mail steamer brought quick-growing seed corn and sweet potatoes for planting. The corn would be available for food in two months, the sweet potatoes in four. At the same time several thousand wild arrow-root plants, an excellent substitute for taro, were dug up in Tutuila and transplanted in Manua. This would give food in six months. Thus the bridge was formed.

Frequent visits were made at regular intervals and the condition of the plantations carefully watched. In spite of the drought and the action of the sun's fierce rays the food products did fairly well. The Government provisions were judiciously distributed and, at my

last visit on January 3, 1916, the Manua group of islands was self-supporting and will need no further help from outside sources. It will be some years, however, before all the villages are completely rebuilt or that conditions will be as they were before the hurricane.

REPORT OF MEDICAL RELIEF AFFORDED IN FLOODED DISTRICTS OF SAN DIEGO.

By C. I. Wood, Assistant Surgeon, United States Navy.

During the last few days of January, 1916, the continuous heavy rainfall in San Diego, Cal., and surrounding country caused an enormous rise of water in the Tia Juana River valley; the river overflowed its banks and carried everything before it over a fertile and populous area comprising thousands of acres. The adjoining Otay Valley was likewise depopulated by the bursting of the lower Otay Dam, and houses, barns, railroads, orange and lemon ranches, and fertile soil were all swept out into San Diego Bay. Hundreds of people were left homeless and a few were drowned.

To relieve the suffering in the district and to retain order about seventy enlisted men of the Navy and Marine Corps were detailed for duty. Asst. Surg. F. L. Conklin, United States Navy, was first detailed as medical officer in charge of the relief work. However, due to his receipt of other orders, he was stationed there only a few days.

On February 2, I was detailed to relieve Dr. Conklin as medical officer in charge of the sanitary work and medical relief for the hundreds of flood sufferers in the Otay and Tia Juana River valleys near San Diego city. My predecessor had the work well started, but owing to the flooded conditions of this region and his short stay there he was unable to travel far and visit all of the afflicted. Upon my arrival the soil was solid enough to support the weight of a horse, so that the regions could be visited either by boat or horseback.

Five good hospital apprentices were furnished, and they were stationed as follows: One at Otay schoolhouse, one at Hayden's farm, Palm City, one at Monument School, and one at San Ysidro. One apprentice was used as a traveling assistant under my direction. These stations are about a mile apart and in the centers of population for that district. There is only one civilian doctor in this entire area. Before the flood, these regions had been visited by doctors with automobiles from the surrounding villages, but after the flood they were unable to enter, as all traffic was impossible, except by means of boat or by horseback.

Fortunately there were no mosquitoes in this region, for there were hundreds of stagnant pools that would have been favorable breeding places for them. Fortunately, too, there were no known cases of typhoid fever in the valley to complicate conditions.

Part of this region had the drinking-water supply shut off, and residents had to resort to surface water for drinking purposes. Plain signs BOIL DRINKING WATER TO PREVENT SICKNESS in large type were printed and posted in conspicuous places over the entire region. Orders to use only boiled and filtered water for drinking purposes in the camps were well observed. The toilets in many places are surface privies and chlorid of lime was furnished to cover the excreta. The dead animals were buried early and no stench from them was noticeable.

Ample food and clothing was furnished at the relief stations to meet the needs of the people. However, due to the wet conditions of the grounds and the exposure, there were many cases of bronchitis and colds.

Many of the houses in this vicinity were overcrowded with refugees. Good sanitary conditions prevail in most of them, however, with the exception of several Mexican families who probably never did have ideal sanitary conditions. The spaces underneath the houses were filled with water in many places and this was bailed out as speedily as possible.

There were few people seriously injured. Those killed either died outright from drowning or were killed by being struck by floating wreckage. The people were warned to leave in time to escape, but some were loath to leave the homes and possessions for which they had labored so assiduously, and were swept away in the torrent. The medical relief was directed toward prophylactic measures and sanitation, and caring for those who were already ailing.

The cases treated were, of course, more varied than the medical officer in the Navy ever meets aboard ship. Roughly estimated, about 175 people received medical and surgical attention and many of these were women and children. As soon as the people learned that free medical attention was at hand they were quick to respond, and then, in turn, told their friends, with the result that quite a medical practice was established. Even some of the old chronic cases that had been suffering for years were "on the job," in hopes that the new doctor could furnish them the desired relief.

A few of the more serious cases were transported to the county hospital. One middle-aged man who had a house and property completely wiped out became insane. Those who knew him before the flood said he had always been of normal mentality and was a hard-working man. He was unable to carry the added strain upon his mental faculties and became unbalanced. He was kept under

observation for two days but became steadily worse and was transferred to the county hospital. One elderly man, who was sick when the flood came, was washed out of bed and died of pneumonia.

To give an idea of the variety of cases treated they will be partially enumerated below:

Abscess of kidney, perinephritic.	Infected wounds.
Arthritis, acute.	Miscarriage.
Asthma.	Nephritis.
Bronchitis, acute.	Pneumonia.
Burns.	Sprains.
Confinement cases.	Stricture of urethra.
Cystitis.	Tonsillitis.
Dermatitis venenata.	Tuberculosis, abdominal.
Enlargement of prostate.	Uremia.
Fracture about ankle joint, simple.	Venereal disease.
Fracture about wrist joint, simple.	

Cases in Monument School district and old Tia Juana were visited with much difficulty. In places the current was swift and the water deep, and in other places it was necessary to drag the small flat-bottomed boat through the mud. Part of the river bottom was composed of very soft mud, and the men who were employed in wading and pushing the boat would sink knee deep. I feel that much credit is due to the enlisted force stationed there for the way they worked, but all seemed to enjoy the change from the routine ship life and regretted to leave when it came time to depart.

The people were very grateful for the medical services tendered and it was an added pleasure to render assistance under such conditions. I wish to thank the hospital apprentices who worked so faithfully. Both the apprentices and myself enjoyed the many new experiences gained.

Of course, outside medical assistance could be utilized there for months to come, but by February 15 the roads became passable to vehicles and near-by physicians could be summoned, so the cases were placed in charge of civilian doctors from that date. The people have been instructed as to hygienic measures, so that an epidemic of typhoid fever or other disease is not likely to occur if they follow instructions as given.

THE MARINE DETACHMENT WITH THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.[1]

By K. C. MELHORN, Passed Assistant Surgeon, United States Navy.

On February 15, 1915, this battalion, under the command of Maj. John T. Myers, United States Marine Corps, proceeded from the

[1] From Annual Sanitary Report, First Battalion, Fourth Regiment, U. S. Marines, Jan. 1, 1916.

marine barracks, navy yard, Mare Island, Cal., to the Panama-Pacific International Exposition grounds at San Francisco, Cal., where its camp was established. It was composed of the Thirty-first, Thirty-second, and Thirty-fourth Companies, the quartermaster's detail. band, and Hospital Corps detachment, a total of 12 officers and 337 enlisted men.

For two weeks prior to February 15 a detail of men from the Thirty-fourth Company had worked steadily to prepare the camp site. This task was by no means an easy one on account of the nature of the soil (sand) and the inclement weather (rainy season). The camp was located within the exposition grounds on the southern shore of San Francisco Bay and was situated within that area lying between the Texas State building and the live-stock exhibit. It was erected on ground recently reclaimed from swamp and considerable difficulty was experienced in installing strong backs, because water was everywhere encountered at a soil depth of 2 feet. But with the advent of the dry season and the macadamizing of the company streets the problem was satisfactorily solved.

Each tent in the battalion was supplied with the following: An excellent wooden tongue-and-groove floor, electric light, oil stove, regulation barrack bed, and specially constructed clothing lockers. The entire camp was well lighted by electric and gas street lamps. erected by the exposition.

Large and roomy bathhouses for enlisted men and officers, respectively, were constructed by the exposition officials, and these were equipped with cement floors, electric lights, ample hot and cold fresh-water showers, and lavatories. The mess hall and kitchen, likewise located in a special frame building on the camp site, possessed a cement flooring, modern plumbing and sewage system, screened walls, screen doors, and electric lights. The city water supply and exposition sewerage and garbage disposal system were used throughout, and proved satisfactory at all times.

The general health of the command was very good. The percentage of sick was 0.9 per cent and the number of deaths two (one from acute alcoholism, the other from hemorrhage, incident to crushing of the pelvis by a motor street-sweeper). There were no epidemics and contagious disease occurred but once—an officer developing mumps in the first week of the camp, the disease having been contracted a few weeks earlier while he was en route from the Philippines, aboard an Army transport. This case was isolated and treated in camp.

As regards venereal disease, there occurred 14 new cases of gonorrhea, 3 of syphilis, and 5 of chancroids. Venereal prophylactic measures were enacted, but, as usual, they failed to protect all ex-

posures of men on extended liberty or who did not report for treatment within an hour.

Of vaccinations there were 12 against typhoid fever and 176 against variola. In regard to the latter, all men whose health records did not show a positive result within the past five years were vaccinated; 10.2 per cent of these were successful.

The sick report shows that in the early months of the exposition quite a large number of foot troubles were present. These consisted for the most part of corns and callous areas and were brought to the fore by the necessary marching on hot and unyielding asphalt pavements. Careful foot, sock, and shoe inspections once a week by the company commanders were recommended, and with a closer attention to these details improvement was marked and immediate. In my experience far more attention should be paid to thorough foot inspections. Such measures should be made a constant weekly routine. There are always some men who will tend toward carelessness and who, unless kept under constant observation, sooner or later become temporarily incapacitated from easily avoidable lesions. Recruits in particular need to have forced upon their attention the proper method of trimming nails, bathing of feet, care of socks, and fitting of shoes. The fitting of new shoes should always be performed under the direction of an officer, and such an act, as well as the size of the shoe, recorded, so that the responsibility for misfits can be determined. As so highly recommended in the report of the shoe board of the United States Army, a weight equal to that borne in heavy marching order should be carried between the shoulders when shoes are fitted. Then, and only then, can the natural spreading of the feet be determined. The use of zinc-oxid adhesive plaster for covering cracks and tears in shoe linings has proved an economic measure of particular interest here. A shoe, absolutely satisfactory as regards soles, vamps, and uppers, may be unfit for further military use because of a torn or cracked lining. The use of adhesive as above noted prolongs the life of the shoe and aids materially in the prevention of chafing and abrasions.

Owing to the close proximity of the camp to the exposition livestock exhibit it was necessary to wage an active and continuous fly campaign. Traps (baited and cleaned daily by a hospital corpsman), fly paper, swatters, and screening were extensively used, especially about the kitchen and mess hall. These measures sufficed until the month of October, when, with the onset of the horse and cattle shows and the fact that the manure was not removed quickly from the bins, flies swarmed about in thousands. At this time there was secured, free of charge, from one of the exhibitors a spraying pump and an unlimited supply of Kreso, a liquid coal-tar product. This preparation, used extensively throughout the fair by the United

States Public Health Service, proved to be all that is claimed for it—an excellent larvacide and insecticide.

The battalion hospital was located in a conspicuous position on the main thoroughfare passing through the camp. Because of this position and the Red Cross flag flying over it thousands of visitors were attracted. It consisted of five regulation hospital tents joined end to end, making in reality one large tent with five compartments. The arrangement from front to rear was as follows: Office, dispensary, ward, screened operating room, and store tent. This scheme proved ideal for all purposes and enabled us to present the fine equipment supplied by the bureau to the best advantage. For publicity purposes there were displayed large Red Cross charts illustrating most of the various methods of teaching first-aid in the Navy, splints, dressings, first-aid packages, tourniquets, blank health records, and the latest Bureau of Medicine and Surgery circulars pertaining to the various corps of that department. The hospital corpsmen—numbering 1 steward, 4 hospital apprentices, first class, and 1 hospital apprentice—personally conducted visitors. Prepared at all times for emergency cases, the hospital was able to render material assistance to the exposition on numerous occasions, particularly on the dates of the Vanderbilt cup race and San Francisco day.

The medical department of this battalion is greatly indebted to the commanding officers of the Letterman General Hospital, United States Army, and the Exposition Emergency Hospital, United States Public Health Service, for the many favors extended to us throughout the entire fair. Their fine motor ambulances, X-ray machines, laboratories, and libraries were always at our disposal and were used accordingly. The proximity of the excellent laboratory of the former institution, in charge of Capt. H. J. Nichols, Medical Corps, United States Army, made the question of Wassermann reactions and autogenous vaccines a simple one and our thanks are particularly due to that officer. Frequent advantage was taken of the connection of Surg. A. E. Peck, United States Navy, with the eye clinics at the Affiliated Medical Colleges in San Francisco. Several cases demanding special ocular diagnosis and treatment were referred to him. Because of our associations with the institutions noted above it can be seen how ideally placed, from a hospital standpoint, was the camp of this battalion.

That these marines fulfilled all expectations from a disciplinary and efficiency standpoint, I believe there can be no doubt. Individually and collectively they were frequently called upon to perform work widely different from what they had been accustomed to, and because of their excellent morale and discipline they always completed it in an efficient manner.

EARLY HISTORY OF THE NAVAL HOSPITAL RESERVATION, WASHINGTON, D. C.[1]

By J. D. GATEWOOD, Medical Director, United States Navy.

It appears that the grounds of the Naval Hospital and the Naval Medical School represent a reservation found on L'Enfant's plan of the city of Washington, said reservation, as shown by note on that plan, having been set aside for occupation by buildings devoted to scientific and educational purposes. The reservation extended between Twenty-third Street and Twenty-fifth Street and E Street and the river. But, as the flats in the locality have been reclaimed, there is now interposed between the grounds and the river a part of Potomac Park, the boundary line being now occupied by a row of poplar trees set out a few years ago.

An act of Congress, August 31, 1842, authorized the erection of a naval observatory on any public grounds in the District of Columbia not otherwise appropriated. President Tyler assigned for the purpose this reservation, and the building then erected and now designated as the Naval Medical School was the Naval Observatory and was devoted to that purpose for approximately half a century. It was on January 20, 1894, that, a new naval observatory having been established, the building and grounds were transferred to the Bureau of Medicine and Surgery by order of the Secretary of the Navy, to be used by the Museum of Hygiene. In 1902 the Naval Medical School was established here in Washington, and the building has since that time been utilized as the school, certain alterations having been made to fit it for such purpose. Therefore it appears that the reservation set aside in L'Enfant's plan for educational and scientific purposes has been so used since its assignment by President Tyler in 1842. This is emphasized by the fact that 5 acres of the western part of the reservation were transferred to the Treasury Department by act of Congress approved March 3, 1901, to be used by the Marine Hospital Service for a laboratory. That part of the reservation is now occupied by the Hygienic Laboratory of the Public Health Service, where not only is a large amount of important scientific work performed, but also a class of medical officers of that service is instructed each year. The reservation consisted originally of about 21 acres. Therefore the 5 acres diverted for the benefit of the Public Health Service leave about 16 acres for the use of the Naval Medical School and of the Naval Hospital, which was constructed under appropriation contained in the act of March 3, 1903.

The historic value of these grounds is considerably increased by the presence near the southern boundary of a rock known as Braddock Rock. It is so called because of the statement that Gen.

[1] From Annual Sanitary Report, Jan. 1, 1916.

Braddock landed on the rock in his expedition of 1755, undertaken for the capture of Fort Duquesne, in which expedition Washington was his aid-de-camp. The rock at that time was, of course, on the water front, but in reclaiming the flats in this locality grades have been extensively altered, and in that connection the hospital grounds near the southern boundary have been filled in and graded, leaving the rock well below the present surface. This situation necessitated the building of a rectangular well with brick walls, at the bottom of which the rock is now found. This rock is the key of keys for this locality, and consequently a very important mark in connection with surveying work in the District.

The history and location of Braddock Rock is of course well known to the various patriotic societies of the country and seems to have attracted the special attention of the Daughters of the American Revolution, who have a committee selected for the purpose of marking historic places associated with the colonial and Revolutionary periods.

It seems not unlikely that the time is not distant when it will be advisable for the Navy to satisfy sentiment by suitable treatment of Braddock Rock, the present situation resulting from a simple attempt to prevent the rock from being covered and consequently lost to view.

In the treatment of that part of the grounds suggestion has been made that some kind of summerhouse might be erected over the rock, vines and flowers planted, and walks laid, the idea being to secure a result that would suggest a shrine, and which would be in opposition to an attempt which has been made to connect that part of the grounds with Potomac Park by road.

A BRIEF SUMMARY OF THE PROFESSIONAL ACTIVITIES OF THE HOSPITAL SHIP "SOLACE" WHILE IN THE PRESENCE OF THE MAJOR PORTION OF THE ATLANTIC FLEET AT GUANTANAMO BAY, CUBA, FOR 61 DAYS, FROM FEBRUARY 9, 1916, TO APRIL 9, 1916.[1]

By R. M. Kennedy, Medical Inspector, United States Navy.

During the vessel's stay of 61 days in Cuban waters its service was very active and much important work was accomplished, as will be seen from the following data:

Total number of patients admitted	315
Total number of patients discharged to duty	162
Total number of patients discharged to change of diagnosis	41
Total number of patients died	3
Total number of patients surveyed	6

[1] From official report to the Bureau of Medicine and Surgery.

Total number of convalescent patients transferred to their ships as patients who would be ready for duty in about 7 to 10 days	12
Total number of patients remaining Apr. 10, 1916	91
Total	315

Number of officer patients admitted	19

Number of officer patients discharged to duty	12
Number of officer patients died	1
Number of officer patients surveyed	1
Officer patient returned to ship as patient	1
Number of officer patients remaining Apr. 10, 1916	4
Total	19

Total number of contagious cases admitted:	
Mumps	4
Tuberculosis	6
Total	10

Total number of venereal cases admitted and their nature:	
Chancroids	7
Gonococcus infections	16
Syphilis	64
Total	87

Greatest number of patients on board at one time	123
Greatest number of contagious cases on board at one time	6
Average number of patients daily on board	81

The *Solace* departed from Guantanamo Bay, Cuba, April 10, for Washington, D. C., with 91 patients on board; of this number, 64, including 4 officers, were transferred to the naval hospital, that place, for further treatment, and convalescence only in most cases. Of this number, four cases of tuberculosis will probably be transferred to the naval hospital, Las Animas, Colo., and a few only will probably have to be discharged by reason of medical survey, as being unfit for the service. The balance of the men were returned to duty on or shortly after arrival of the ship at the navy yard, New York, April 19, 1916.

Number of laboratory examinations made, nature, and result.

Blood:	
White counts	54
Differential	8
Negative for malaria	23
Widal test, negative	2
Coagulation, three and one-half minutes capillary tube	2
Coagulation, four minutes capillary tube	1
Culture, negative for typhoid bacillus	2
	92

Feces:		
Positive for blood	1	
Negative for blood	1	
Negative for parasites	9	
Positive, *Trichuris trichiura*	1	
		12
Sputum:		
Positive for tuberculosis	2	
Negative for tuberculosis	28	
		30
Urine:		
Albumin	21	
Sugar	1	
Negative	86	
		108
Autogenous vaccines		3
Cerebrospinal fluid:		
Cell counts	2	
Positive Noguchi	1	
		3
Pleural fluid, pus cells		1
Tuberculin skin reaction, negative		2
Smear:		
From boil, negative for tuberculosis	1	
From ear discharge, negative for bacterial organisms	1	
From eye—		
Positive, gram-positive diplococci	1	
Negative, gram-positive diplococci	1	
Positive for cocci	2	
From penis—		
Positive, gram-negative diplococci	4	
Negative, gram-negative diplococci	3	
Negative for diphtheria	1	
From prostatic fluid, positive, gram-positive cocci	1	
From throat, negative for diphtheria	1	
From peritoneal cavity, negative for tuberculosis	1	
		17
Scraping from sore on penis:		
Positive for treponema	2	
Negative for treponema	2	
		4
Noguchi tests:		
Positive	89	
Negative	380	
		469
Vaccinations:		
Antityphoid	23	
Cowpox:		
Positive	25	
Negative	205	
		253
Total		994
Greatest number of laboratory examinations made in one day		48

Number of eye, ear, nose, and throat examinations, treatments, and nature of operations performed.

Eye treatments	261	
Refractions	286	
Ear treatments	370	
Nose treatments	375	
Throat treatments	264	
		1,556
Major operations:		
Mastoid, modified, radical	2	
Mastoid, radical (plastic)	1	
		3
Minor operations:		
Abscess of orbit, incision and drainage	1	
Adenoidectomy	2	
Polypus, nasal, removal	11	
Polypus, aural, removal	5	
Tonsillotomy	3	
Tonsillectomy	5	
Septum, submucous resection	15	
Paracentesis, drum	5	
Turbinotomy	7	
Chalazion, incision and drainage	2	
Pterygium, excision of	1	
Ossiculectomy	1	
Cauterization, linear, of inferior turbinate	4	
Cyst, orbit, excision of	1	
		63
Total		1,622

Number of major and minor operations performed, and their nature.

Major operations:		
Appendectomy	26	
Laparotomy, exploratory	1	
Laparotomy, tuberculosis of intestines	1	
Laparotomy, suppurative peritonitis	2	
Herniotomy	17	
Resection of rib (empyema)	1	
Tubercular sinus of neck, excision	1	
Varicose veins of leg, radical	3	
		52
Minor operations:		
Amputation, thumb	1	
Amputation, toe	2	
Fistula in ano, excision	1	
Epithelioma of cheek, excision	1	
Hemorrhoidectomy	2	
Hydrocele, radical operation	1	
Varicocele, radical operation	3	
Adenotomy, inguinal	1	
Intravenous medication (solution sodium bicarbonate)	2	
		14
Total		66

Number of operations performed in the genito-urinary department and their nature.

Adenoctomy, inguinal	3	
Abscess unqualified, incision and drainage	1	
Circumcision	1	
Prostate gland, incision and drainage	1	
Intravenous injections of salvarsan	55	
Cystoscopic examinations	4	
Total		65

Nature of work done in dental department, itemized.

Fillings:		
Amalgam, ordinary	285	
Amalgam, built on post	6	
Cement, permanent	93	
Cement, synthetic	39	
Cement, temporary	24	
Gutta-percha, permanent	7	
Gutta-percha, temporary	38	
Other than listed	16	
		508
Abscess:		
Acute and blind, lanced	20	
Chronic and fistulous, treated	13	
		33
Bridge:		
Removed	4	
Recemented	2	
		6
Crown:		
Gold, recemented	4	
Gold, removed	8	
Porcelain, recemented	4	
		16
Gums treated:		
Gingivitis	3	
Pyorrhea	7	
Other local inflammation	3	
		13
Impacted teeth:		
Extracted		5
Inlays:		
Removed		1
Maxillæ treated:		
Fractured		1
Prophylaxis:		
Calculus removed (sets)	5	
Cleaned and polished (sets)	32	
		37
Pulps:		
Exposed and extirpated	38	
Exposed and devitalized	9	
Putrescent	17	
		64

Roots:		
Canals filled	26	
Canals treated	29	
Extracted	126	
		181
Teeth extracted:		
Other than roots		9
Operations and treatment not listed:		
First examinations	193	
Cellulitis	1	
		194
Total		1,068

Number of X-ray examinations made and parts examined.

Head:	
Frontal sinus	2
Mastoid region	4
Nasal, ethmoid region	1
Neck	3
Shoulder	3
Chest	6
Arm	9
Elbow	4
Forearm	12
Hand	46
Stomach	2
Kidney region	11
Abdominal region	2
Pelvis	3
Hip	1
Thigh	3
Knee	14
Leg	5
Foot	28
Dental exposures	16
Total	175

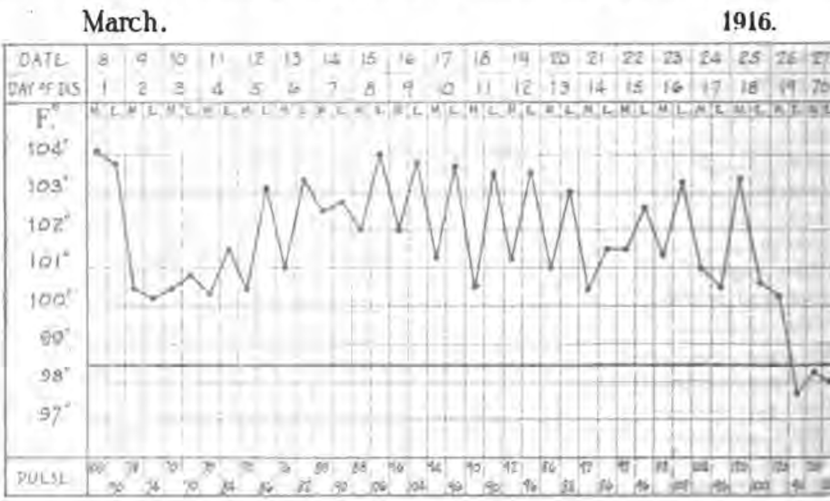
Number of treatments to crews of auxiliary ships not provided with a medical officer	99
Requisitions for medical stores:	
Number of requisitions filled	61
Number of ships and stations by whom requisitions were made	32
Number of bodies embalmed and prepared for shipment	7

A CASE OF ABDOMINAL TUBERCULOSIS.[1]

W —, seaman, found unconscious in tent at rifle range, Guantanamo, about noon March 8; received on board *Solace* at 1.30 p. m. same date; temperature 105°, pulse 102, respiration 22. Pupils normal; some mental confusion, drowsy, but answered questions fairly

[1] Report submitted by A. D. McLean, surgeon, United States Navy.

intelligently when awakened. States he was perfectly well until yesterday, when he awoke with a heavy feeling in upper part of abdomen and general indisposition; remembered nothing of having been overcome by sun. Alcohol baths and ice brought temperature down to 102°. March 9, somewhat improved; temperature 102°, pulse 80, bowels open, urine negative, reflexes exaggerated; taking considerable nourishment. No headache, pain along spine, or stiffness of neck muscles; Kernig's symptom not present; had slight cough with some expectoration of mucopurulent sputum. No symptoms other than temperature, slight mental confusion, and some exaggeration of all reflexes. March 13, not so well; complained of some pain throughout abdomen in general, but no localized spot of intensity; other symptoms unchanged. White-cell count 10,000. March 16, the same, except he complained of more abdominal



Abdominal tuberculosis.

pain; temperature ranging from 100.4° to 103°. Spinal puncture, but fluid negative; blood negative for malaria; white-cell count 20,000. Physical signs in vicinity right apex indicate tubercular involvement; sputum negative; family history negative. Does not take nourishment well. March 20, Widal and blood culture negative for typhoid. Urine contains some albumin and considerable bile pigment. Complains of much pain throughout abdomen, but owing to sensitiveness and rigidity of abdominal muscles nothing definite can be determined as patient is unable to remain relaxed during examination. In general, symptoms point to abdominal tuberculosis. Temperature curve does not indicate sepsis. March 24, marked chill at 8.45 a. m. which was followed by rise in temperature to 103.8° by 10 a. m. and then a drop to 99.2° by noon. White-

cell count 24,000; blood negative for malaria. Vomited for first time, and vomitus consisted of almost clear bile. No apparent distention of abdomen; bowels well open; complains of food exciting the pains in abdomen. March 25, condition about the same; temperature ranging from 100.2° to 102.6°; mild chill at 7.30 a. m.; vomited 100 c. c. clear bile at 12.30 p. m. Complains of severe pain all through abdomen. Differential white-cell count shows 92 per cent polymorphonuclear; indication of slight abdominal distention present. March 27, a tentative diagnosis of abdominal tuberculosis had been held for some days past, and, owing to the marked abdominal pain and increased white-cell count, an exploratory laparotomy was done at 10.30 a. m. Considerable peritoneal fluid was found; intestines congested and slightly distended and an ulcer three-fourths inch long and one-fourth inch wide, running transversely to the long axis of the bowel, was found in the ileum, but as yet had not broken through the peritoneal coat. Operation showed a general tubercular involvement. Patient reacted from operation very well, but died at 11.45 p. m.

Diagnosis changed to "tuberculosis, abdominal," as the necropsy showed a condition of long standing. The sunstroke was merely secondary, and no doubt incited the tubercular condition very forcibly. The high white cell count, as shown by necropsy, no doubt was due to the ulcerated mesenteric glands which formed three separate and distinct abscesses.

Necropsy findings were as follows: Increased peritoneal fluid; omentum congested; intestines congested, distended with gas, and numerous enlarged mesenteric glands. Three separate abscesses in mesentery in vicinity of spinal column, each containing about 30 c. c. thick, whitish pus; liver enlarged and showing mottled appearance of light and dark areas; many small metastatic abscesses varying from the size of a small pea to that of a pinhead, most of which were located in the right lobe; lungs, evidence of tuberculosis in apex of right lung; left lung appeared about normal; heart, large organized fibrinous clot in right ventricle; kidneys and spleen appeared about normal macroscopically.

A CASE OF SYPHILIS.[1]

S —, seaman. Previous history: Admitted with chancroid of lymph node December 28, 1915, and readmitted with same disease February 11, 1916. Admitted with cholangitis, acute, February 25, 1916; had considerable jaundice, loss of appetite, and dull pains over stomach and hepatic region. Physical examination negative. Rest

[1] Report submitted by E. L. Woods, passed assistant surgeon, United States Navy.

and liquid diet, laxatives. March 1, improved; March 6, about the same—still jaundiced; March 12, no changes in condition; vomits at times and appetite poor. All symptoms are suggestive of cholangitis, and possibly gallstones. Patient also has syphilis with secondary eruptions, induration on penis, chancroid, and bubo which has been opened and dressed.

Readmitted, *Solace*, March 13, 1916. Patient had most intense jaundice; liver enlarged and tender—extends about three or four finger-breadths below costal border; smooth; ascites in moderate amount. Chancre, bubo, adenopathy, and secondary rash present.

Treatment.—Sodium sulphate and injections of salicylate of mercury intramuscularly, 1 grain weekly. Diagnosis changed to syphilis; salvarsan 6.6 gm. intravenously; moderate reaction. March 20, chancre nearly well; liver apparently decreasing in size; ascites still present. Patient sleeps a great deal and his speech is beginning to be thickened and of a scanning type; intramuscular injections of salicylate of mercury begun. March 22, patient delirious, arose from bed and attempted to lift a ladder; knee-jerks absent; pupils sluggish; speech worse. March 23, temperature has been normal since admission. Attempted to bite his wrists and fight the attendant. Morphin one-fourth grain by hypo. Pulse 112, strong and full; respiration dropped to nine a minute. Salvarsan 0.6 intravenously: no reaction. Four hours later 50 c. c. of blood withdrawn to prepare salvarsanized and mercurialized serum for intraspinous injection. March 24, condition about the same; lies in stupor—can not be roused. Urine withdrawn by catheter and shows faint trace of albumin and bile, but no casts; 30 c. c. of spinal fluid withdrawn; first 10 c. c. clear, after that all blood tinged; 30 c. c. of salvarsanized-mercurialized serum injected. The spinal pressure is apparently normal, though no apparatus is available for measuring it. Blood pressure 130. Spinal fluid examination shows Noguchi plus 4; globulin positive; cell count 8. About three hours after spinal injection patient talked a little and drank from a glass which he held; he promptly relapsed into a comatose condition. Condition grew worse; pulse weak and rapid; impossible to rouse him. Died at 8.50 p. m. without regaining consciousness.

Postmortem findings as follows: Quantity of fluid in peritoneal cavity; liver shows two large scars on inferior surface of right lobe; entire liver very hard and firm; about normal in size, and all the upper surface except 1 or 2 inches from the borders was irregular, uneven, dark in color, and rough. Meninges deeply congested; cerebrospinal fluid bloody and in excessive quantity. Inferior surface of both frontal lobes softened and anemic.

THE FRENCH HOSPITAL OF CHUNGKING, CHINA.

By W. B. Hetfield, Assistant Surgeon, United States Navy.

In reading Dr. R. H. Laning's masterly article on Yangtze River hospitals[1] one can not but be impressed with its value to medical officers who are coming to this station and with its detailed information correct in all but as regards the above-mentioned hospital in Chungking.

As we will in the future doubtless have a gunboat constantly stationed at Chungking, and as our medical officers are most welcome at this institution, where they can operate and take care both of their naval patients and also natives (the only hospital here where this is possible), it seems most important that the erroneous information given Dr. Laning should be corrected, to wit, that this hospital had practically closed.

The French hospital is managed by the Franciscan Sisters, the same order that has charge of the Shanghai General Hospital and the Hankow International. There are eight sisters here, four of whom are trained nurses, graduated in France. Another sister is an experienced pharmacist. Ordinarily, the surgeon in charge is a French Colonial Army surgeon, who is stationed here in connection with the French consulate. Dr. Charles Trividic was the last of the French surgeons in charge. He was recalled to the colors in August, 1914. The mission at that time offered Surg. Morse, of H. M. S. *Teal*, charge. Dr. Morse attended to the medical work until the latter part of October, 1914, at which time the British gunboats were interned. From November 1 on the medical officers of the American gunboats were offered and accepted the medical responsibilities.

This hospital contains 80 beds, divided between male and female cases, and 10 private rooms. There is a special building provided for contagious diseases. The wards are large, clean, and well ventilated. There is a splendid courtyard and garden within the hospital compound into which, on sunny days, the patients can be moved and placed in invalid chairs. The hospital has a distilling plant which provides an abundance of pure water for all. There is a well-equipped operating room and a large dispensary.

During the year—from September 1, 1914, to September 1, 1915—there were 470 ward patients treated within the hospital, giving 14,000 sick days. The dispensary records show 15,900 calls. The situation is admirable, in fact, undoubtedly the best in Chungking. It is high on a bluff overlooking the Yangtze. Charges are $2 Mexican a month for ward patients. No applicants, however, are turned

[1] Naval Medical Bulletin, ix, No. 4, October, 1915.

away if too poor to pay this sum. Three dollars Mexican a day is the cost of a private room.

The medical officer of the U. S. S. *Monocacy* attended to all the work, both dispensary and indoor, from November 1, 1914, to May 20, 1915, at which time the gunboat left for Shanghai. During this time over 1,200 patients were seen. As soon as our relief, the U. S. S. *Palos*, arrived, her medical officer continued the work.

As the frequent cruising of a gunboat, however, necessitates the absence of the medical officer, the mission decided to obtain a resident surgeon, if possible. Accordingly, at present a foreign-trained Chinese surgeon is employed as a resident surgeon and the medical officer of the *Monocacy* acts in a visiting capacity.

The few naval sick that we have had here have all been taken to this institution. Should the patient be dangerously ill and the medical officer deem it advisable to stay within the city in order to be close to his patient, the sisters will provide a room in the hospital for him.

Medical officers can obtain most valuable experience at this institution, are always welcome, and have the status of a visiting physician and surgeon.

VOL. 10 NO. 4

UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED FOR THE

INFORMATION OF THE MEDICAL DEPARTMENT OF THE SERVICE

ISSUED BY
THE BUREAU OF MEDICINE AND SURGERY
NAVY DEPARTMENT
DIVISION OF PUBLICATIONS
PASSED ASSISTANT SURGEON ROBERT C. RANSDELL, U. S. NAVY
IN CHARGE

OCTOBER, 1916

(QUARTERLY)

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

NAVY DEPARTMENT,
Washington, March 20, 1907.

This United States Naval Medical Bulletin is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

NOTE.

Owing to the exhaustion of certain numbers of the Bulletin and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume I, No. 1, April, 1907.
Volume I, No. 2, July, 1907.
Volume I, No. 3, October, 1907.
Volume II, No. 1, January, 1908.
Volume II, No. 2, April, 1908.
Volume VI, No. 3, July, 1912.
Volume VII, No. 3, July, 1913.

SUBSCRIPTION PRICE OF THE BULLETIN.

Subscriptions should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C.

Yearly subscription, beginning January 1, $1; for foreign subscription add 25 cents for postage.

Single numbers, domestic, 25 cents; foreign, 31 cents, which includes foreign postage.

Exchange of publications will be extended to medical and scientific organizations, societies, laboratories, and journals. Communications on this subject should be addressed to the Surgeon General, United States Navy, Washington, D. C.

TABLE OF CONTENTS.

PREFACE.

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the personnel of the Medical Department of the Navy in the performance of their duties, with the ultimate object that they may continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the NAVAL MEDICAL BULLETIN shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, dentistry, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part as extracts) throughout the service, not only will they be employed to some purpose as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Reviews of advances in medical sciences of special professional interest to the service, as published in foreign and home journals, will be given particular attention. While certain medical officers will regularly contribute to this work, it is urged that all others cooperate by submitting such abstracts from the literature as they may at any time deem appropriate.

Information received from all sources will be used, and the bureau extends an invitation to all officers to prepare and forward, with a view to publication, contributions on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

W. C. BRAISTED,
Surgeon General, United States Navy.

U. S. NAVAL MEDICAL BULLETIN.

Vol. 10. October, 1916. No. 4

SPECIAL ARTICLES.

STUDIES OF INDUSTRIAL ACCIDENTS WHICH OCCURRED IN THE NAVY YARD AT WASHINGTON, D. C.

By W. A. Bloedorn, Passed Assistant Surgeon, United States Navy.

For many years our efforts have been directed toward the prevention of disease almost exclusively, and we have ignored until recently the damage done to life and limb, the incapacity and the economic loss to society, resulting from industrial accidents and injuries. We have succeeded in great measure in controlling smallpox, we have robbed typhoid of its virulence, we have learned to wage a relentless war against the insect-carriers of disease, we have surrounded ourselves with every known safeguard against cholera and plague, and in the meantime we have ignored the great havoc taking place in our midst through industrial accidents.

A conservative estimate of the annual number of accidents in the United States which result fatally, or in partial or total incapacity on the part of the worker, has been placed by workers in this field at 500,000, representing an economic loss of $250,000,000 a year. The suffering involved and the hardship inflicted on the families of the injured workmen can not be estimated in terms of dollars and cents.

We have acquired a reputation as a nation of wasters. It is apparent that whenever a life is lost or a workman incapacitated the cost of maintenance of the remainder of the population is thereby increased. We would do well in "conserving our national resources" to place the conservation of the life and limb of the workingman at the head of the list.

It is evident that we are becoming aroused to the need for an effective means to check this enormous economic waste. The nation-wide movement toward safety, toward accident prevention, and toward the elimination of the hazards of life is a mighty protest against this destruction which is taking place daily.

That one-half of the accidents in the United States are preventable is the general opinion of the engineering profession.

In order that the effects of industrial accidents would not fall solely upon the individual injured and thereby work hardship upon the wageworker and his family, Congress passed a workmen's compensation act which became effective August 1, 1908, and which granted to certain employees of the United States the right to receive from it compensation for injuries sustained in the course of their employment. This act has been amended from time to time and its scope enlarged so as to apply to workers in other branches of the Government service, particularly the Isthmian Canal, Bureau of Mines, Forestry Service, and Lighthouse Service.

The following is a brief analysis of the law from the United States Bureau of Labor Statistics:

Injuries compensated are those received in the course of employment, causing disability for more than 15 days, or death, if not due to the negligence or misconduct of the employee injured.

Industries covered are manufacturing establishments, arsenals, navy yards, construction of river and harbor fortification work, construction work in the reclamation of arid lands, or management and control of the same (hazardous employment only) under the Bureau of Mines, the Forestry Service, or the Lighthouse Service.

Persons covered by the law are artisans or laborers employed by the United States in the above-mentioned works, except under the Isthmian Canal Commission, where all employees are covered, and under the Bureau of Mines, the Forestry Service, and the Lighthouse Service, where all employees engaged in any hazardous work are covered.

The burden of payment falls upon the branch of service or office where the person injured is employed; i. e., it comes from the same appropriation as that from which the wages have been paid.

Compensation for death is one year's wages minus the amount due for any time between the day injured and the day of death, payable only in case a widow, or children under 16 years of age, or dependent parents survive. The distribution of the amount of compensation among several claimants is made in such proportions as the Secretary of Labor may prescribe. If a widow dies during the year, her amount is redistributed among the other beneficiaries, if any.

Compensation for disability is the same as if the injured person had continued to be employed for the entire time of disability, but not over one year.

The majority of the States now have workmen's compensation or employers' liability acts in some form or other, and a similar system has been in force in European countries for many years.

However admirable such a system of compensation may be, and needless to say it has served to relieve much suffering and hardship among workmen and their families, the fact remains that compensa-

tion is in the nature of an apology which the employer offers the injured workmen, and is in itself a recognition of liability on the part of the employer. True benevolence consists in the prevention of the accident, and it is along this line that the large industrial concerns are bending their efforts at the present time.

It is with this end in view that the present work was undertaken and an attempt made to analyze the various factors that enter into the occurrence of accidents, in order that we may secure every possible advantage in combating them. In place of going directly to the machine or the character of work performed by the workman, we have secured data relating to the individual himself. In other words, the personal element has been investigated to see if any light could be had on the subject from that direction. The class of work performed, the character of the machine used, the shop itself and factors relating to it which might bear on the injuries, were looked into, and the subject of safety appliances is taken up with recommendation for their use wherever considered desirable and practicable. It is evident that any inquiry directed at the individual himself will not reveal all the factors entering into industrial accidents, and on the other hand a consideration of the machine or character of work in itself ignores a vital factor in the production of accidents, namely, the personal element involved, and it is only by taking into account both these factors that we may reach a logical conclusion.

It is apparent that each workman presents himself to the employer with a different physical make-up, and that this is an important factor in determining his efficiency. Whereas formerly this factor was ignored to a great extent, of late years the wisdom of a thorough physical examination of every candidate before employment is now generally recognized, and the candidate's rating depends not alone on his mechanical ability, experience, and skill, but to large extent on his physical condition. This procedure eliminates a certain number who are manifestly unfit and serves to increase the working efficiency and to lower the accident rate of those actually employed.

In attempting to analyze the various factors that enter into the production of accidents, we have taken as a basis all accidents which occurred in the yard for a period of two years, beginning January 1, 1914, as the records from that time were kept on a new form, which was more complete and which served to furnish the basis for the data which have been classified. It must be remembered that all accidents or injuries are required to be reported, whether slight or serious, and whether incapacitating the workman or not. This is necessary in order to enable the workmen's compensation act to be administered equitably, as many accidents which appear slight at first examination may become the basis for claims later, due either to neglect, infection, or to the character of the work performed. So

in order that claims for compensation may be satisfactorily adjusted, both from the standpoint of the injured workman and from the standpoint of the employer, it is imperative that all injuries sustained in the course of employment be reported immediately, so that a record may be made of them and also that the wound may be cleansed and protected by a first-aid dressing. If this procedure were followed out rigidly many injuries such as slight burns, abrasions, lacerations, and incisions by being dressed promptly would not become infected, cause loss of time, and thus become the basis of claims for compensation.

It is just as necessary from the standpoint of the workman that he report a minor injury at once, as it is only in this way that the fact of injury can be recorded; and should the injury result in loss of time later on, the record would be an important factor in establishing his right to compensation.

In classifying the records of injuries reported during the calendar years of 1914 and 1915 we have thrown out all injuries of which the origin was in doubt and included only those received in the course of employment. The total number of injuries reported during this period, which occurred in the course of employment, was 4,711, of which 443 caused loss of time.

For each injury reported a regular form was filled out which contained the following data:

1. Name.
2. Tag number.
3. Rate.
4. Shop.
5. Diagnosis (nature, location, and extent of injury).
6. Disposition:
   (a) Return to work.
   (b) Return to home.
7. Time of day injured.
8. Date of injury.
9. Due or not due to employment.

If the injured employee was unable to continue at work he was sent home, or if seriously injured sent to the hospital. When able to return to work a record was kept of this fact showing time and date of his return. In this way a record of the number of days lost in each case is available. These records are filed away in alphabetical order, so that they admit of accurate classification. In addition to the data contained in these records of the injury the following data were secured from each employee whether he had been injured or not:

1. Age.
2. Race:
   (a) White.
   (b) Colored.
3. Marital condition.
4. Length of time employed.

The average number of men employed during these two years was 3,202. This figure was obtained by taking the average number employed for each month and dividing by 24. The total number of men who reported one or more injuries was 2,178. The following tables are all based on the average number of men employed for the 2-year period.

Table No. 1 shows all employees classified into 10 groups according to their age, the total number of injuries which occurred in each group, and the percentage of injuries based on the relation of number of men employed to number of injuries. In figure 1 we have shown the curve taken by the percentage of injuries in each group represented by the solid line, and at the same time the number of men actually employed in each group as shown by the dotted line.

TABLE No. 1.—*Relation of injuries to age.*

Age.	Average number of men employed.	Number of injuries.	Percentage of men injured.
16 to 20	275	585	213
21 to 24	274	636	232
25 to 29	405	662	163
30 to 34	456	720	158
35 to 39	575	779	135
40 to 44	421	565	134
45 to 49	257	281	109
50 to 59	314	270	85
60 to 69	138	127	92
70 and over	87	86	99

In the first group, which comprises 275 men from 16 to 20 years of age and 585 injuries, we have a sharp rise in the percentage curve to 213. In the second group, which comprises 274 men from 21 to 24 years of age and 636 injuries, we see a further rise in the percentage curve to 232, which is the highest point attained. In the third group, which comprises 405 men from 25 to 29 years of age and 662 injuries, the percentage curve drops quickly to 163. In group 4, which comprises 456 men from 30 to 34 years of age and 720 injuries, we have a further reduction in the percentage curve to 158. Group 5, comprising 575 men from 35 to 39 years of age and 779 injuries, shows the percentage curve still declining to 135. Group 6, comprising 421 men from 40 to 44 years of age and 565 injuries, shows the percentage rate declining slightly to 134. Group 7, comprising 257 men from 45 to 49 years of age and 281 injuries, shows a still further decline in the percentage rate to 109. Group 8, comprising 314 men from 50 to 59 years of age and 270 injuries, shows a percentage of 85, which is the lowest rate of any group. Group 9, comprising 138 men from 60 to 69 years of age and 127 injuries, shows the percentage curve rising again, reaching 92. Group 10, comprising 87 men of 70 years of age or over and 86 injuries, shows still further rise to 99.

Viewing the chart as a whole we can see a sudden, sharp rise in the accident rate in group 1, a still further increase in group 2, which shows the highest rate, and then a gradual, steady, persistent decrease in the rate to group 8, which contains the lowest rate. From this point the line advances steadily to group 10.

It is apparent at once that the relation of injury to age is a vital one and that groups 1 and 2 will bear particular attention in our efforts at accident prevention. The fact that group 8 shows the

CHART No. 1.—Relation of injuries to age.

lowest rate is also of interest and is worthy of consideration fr[om the] standpoint of efficiency.

Table No. 2 shows the men employed divided into colore[d and] white, with the number of men, the number of injuries, an[d the] percentage of injuries in each class. The number of white emp[loyees] was 2,896 and the number of injuries in this group 4,212, s[howing] a percentage of 145. The number of colored employees was ... the number of injuries in this group 499, showing a percenta[ge]

163. The difference in percentage of injuries in these two groups is marked enough to be of special interest. The character of work performed by the colored employee is, as a rule, less hazardous than that of the white employee, and he is rarely assigned to work which requires close contact with machinery or which would expose him to frequent injury.

TABLE No. 2.—*Relation of injuries to race.*

Race.	Average number of men employed.	Number of injuries.	Percentage of men injured.
White	2,896	4,212	145
Colored	306	499	163

This fact would serve to accentuate the difference between the two groups and make the higher injury rate of the colored employee more significant.

Table No. 3 shows all employees classified according to marital condition. Those married numbered 2,342 and received 3,405 injuries, showing a percentage of 145. The single employees numbered 860 and received 1,306 injuries, showing a percentage of 151. This lower percentage of injuries among the married employees while not marked is still a matter of interest. It may indicate a more careful attitude toward their work and a greater sense of responsibility which the support and maintenance of a family would naturally favor.

TABLE No. 3.—*Relation of injuries to marital condition.*

Marital condition.	Average number of men employed.	Number of injuries.	Percentage of men injured.
Married	2,342	3,405	145
Single	860	1,306	151

They would be less apt to expose themselves to danger or to take chances of incurring injury which might result in incapacity, thereby placing those dependent on them in a precarious position. Again it was noted in preparing this table that the majority of the single employees fell in groups 1 and 2 of the first table, which included all those from 16 to 24 years of age. It will be remembered that these two groups showed the highest percentage of injuries in Table 1.

Table No. 4 shows the relation of injury to length of time employed. All employees were divided into eight classes according to length of time employed, and the number of injuries occurring in each class was determined. The percentage of injuries was then

based on the relation of these two figures. The first group includes men employed from 1 to 6 months and embraces 480 men and 334 injuries, showing a percentage of 69. The second group comprises 291 men employed from 6 to 12 months and 357 injuries, showing a percentage of 123. The third group comprises 170 men employed from 1 to 2 years and 346 injuries, showing a percentage of 203. Group 4 contains 368 men employed from 2 to 5 years and 871 injuries, showing a percentage of 237. Group 5 contains 482 men employed from 5 to 10 years and 937 injuries, showing a percentage of 194. Group 6 contains 1,161 men employed from 10 to 20 years and 1,688 injuries, showing a percentage of 145. Group 7 contains 216 men employed from 20 to 30 years and 164 injuries, showing a percentage of 76. Group 8 contains 34 men employed for 30 years or over and 14 injuries, showing a percentage of 41.

TABLE No. 4.—*Relation of injuries to length of time employed.*

Period of time employed.	Average number of men employed.	Number of injuries.	Percentage of men injured.
1 to 6 months	480	334	69
6 to 12 months	291	357	123
1 to 2 years	170	346	203
2 to 5 years	368	871	237
5 to 10 years	482	937	194
10 to 20 years	1,161	1,688	145
20 to 30 years	216	164	76
30 years and over	34	14	41

The average period of employment of group 1 may be considered as 3 months, of group 2 as 9 months, and of group 3 as 18 months. In the remaining five groups the period of employment was 24 months. In order to compare these eight groups we must consider them for equal periods of employment. It is apparent that the men of group 1 were exposed to injury for a period of 3 months, and those of groups 4, 5, 6, 7, and 8 for a period of 2 years. So we may say that if the injury rate remained the same in group 1 over a period of 24 months it would reach a percentage of 552. Similarly in group 2 the injury rate would amount to a percentage of 328 if it had continued at the same rate for a period of 2 years. In group 3 if the injury rate had continued the same for a period of 24 months we would have a percentage of 270.

Chart No. 2 shows the relation of injuries to length of time employed, each group being considered for a period of 24 months. The solid line represents the percentage of injuries and the dotted line the actual number of men employed in each group. In group 1, covering men employed from 1 to 6 months, we see a sudden, sharp rise in the percentage curve to 552. In group 2, covering men employed from 6 to 12 months, we see a marked decline from this point to a

percentage of 328. From this point the decline is steady but gradual, showing a decrease of approximately one square for each group.

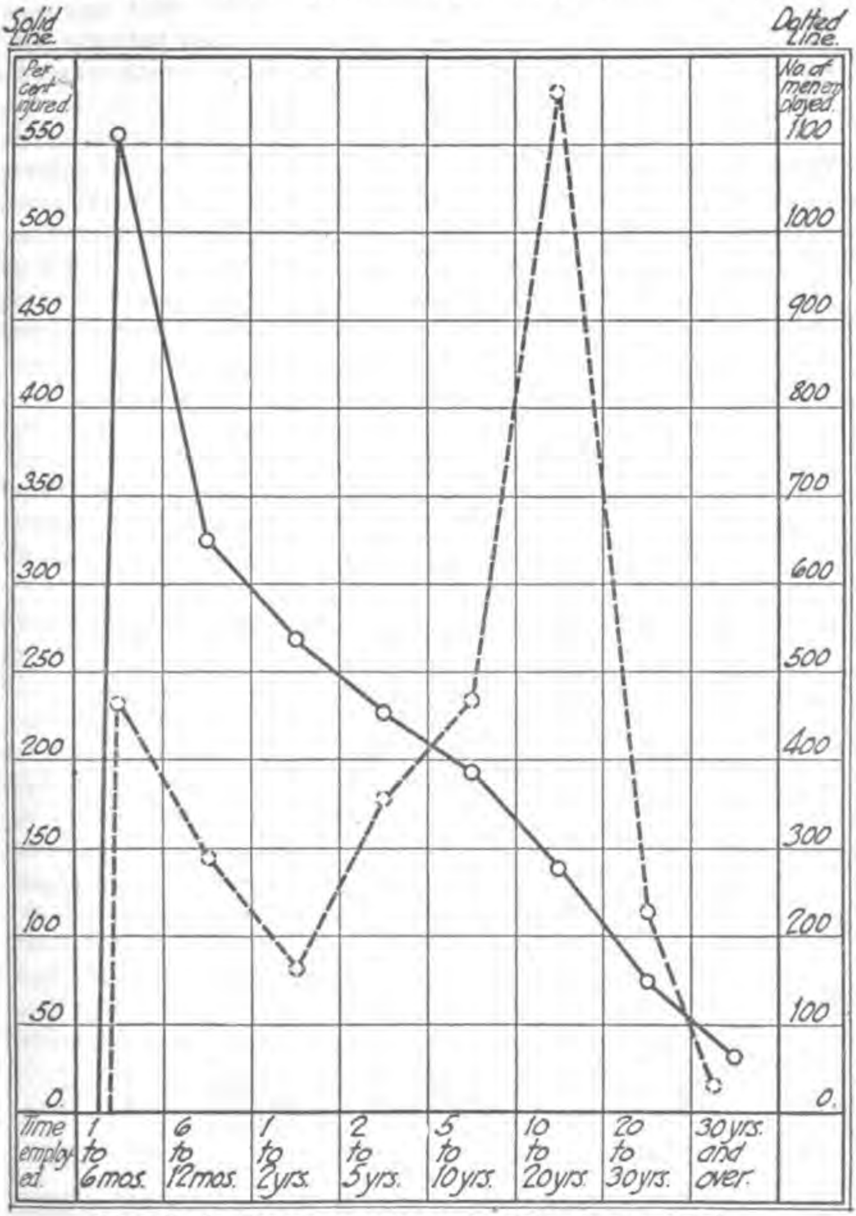


CHART No. 2.—The relation of injuries to length of time employed.

This lowering of the accident rate from groups 1 to 8 occurs with startling regularity and without a break in its downward course. Viewing the chart as a whole we may say that the accident rate

becomes less as the period of employment increases and that in lowering the percentage of accidents among employees we would do well to pay particular attention to the new man until he adapts himself to his environment and becomes acquainted not only with his machine or tool but with his fellow workmen, with whom he must cooperate in performing his task.

Table No. 5 shows all employees divided into three groups, with the number of men, number of injuries, and percentage of injuries in each group. Group 1 includes all carpenters, machinisits, metal workers, molders, masons, and boiler makers, and takes in all workers classed as skilled. This group comprises 2,171 men and 2,671 injuries, showing a percentage of 123. Group 2 includes all apprentices and helpers. The apprentices are men learning a trade such as that of coppersmith, joiner, machinist, and molder. The helpers are assistants for the skilled workmen or do general unskilled work. Group 2 comprises 745 men and 1,563 injuries, showing a percentage of 209. Group 3 includes all laborers, hodcarriers, and janitors, numbering 286 and 477 injuries, showing a percentage of 167. This table shows the skilled men as having the lowest percentage of injuries, although they come into closer contact with machinery. They are the men who, as a rule, are experienced, have been employed for a number of years, and are past 25 years of age. Group 2 shows the highest percentage of injuries. This group includes all apprentices and helpers. Apprentices are employed between the ages of 16 and 18 and are in the process of learning their trade. The high percentage of injuries in this group is a matter of particular interest, since in Table 1 we see the highest injury rate occurring between the ages of 16 to 24, and in Table No. 4 the injury rate for the first year of employment is greatly in excess of any other period. These three tables serve to throw considerable light on the accident rate and point out the direction in which our efforts at accident prevention may be directed. Group 3 includes all laborers and stands about midway in the injury rate between skilled labor and helpers and apprentices. This group includes a large percentage of colored workmen, and it will be seen from Table No. 2 that the colored workmen showed a higher injury rate.

TABLE No. 5.—*Relation of injuries to class of employees.*

Classes of men employed.	Average number of men employed.	Number of injuries.	Percentage of men injured.
Skilled	2,171	2,671	123
Helpers and apprentices	745	1,563	209
Laborers	286	477	167

Table No. 6 shows average number of men employed, number of injuries, and percentage of injuries for the calendar years 1914 and 1915. In 1914 the average number of men employed was 3,007, and there occurred 2,036 injuries, showing a percentage of 67.7. In 1915 the average number of men employed was 3,397, and there were 2,675 injuries, showing a percentage of 78.7. This shows a higher injury rate of 11 per cent for 1915. There are two reasons for this increase. In the first place, a great many new men were taken on during 1915, which in itself would tend to increase the rate of this year, as illustrated in Table 4. In the second place, the necessity of reporting all injuries promptly was more strongly impressed on the men, and this, no doubt, resulted in the recording of a greater number of minor injuries for this period.

TABLE No. 6.—*Relation of injuries to each year.*

Year.	Average number of men employed.	Number of injuries.	Percentage of men injured.
1914	3,007	2,036	67.7
1915	3,397	2,675	78.7

Table No. 7 shows the average number of men employed, the number of injuries, and the percentage of injuries for each month of the years 1914 and 1915. In comparing the months it is apparent that we must consider them on the basis of the number of working days in each month. To arrive at this basis the holidays, half-holidays, and Sundays were substracted from all months to arrive at the actual number of working days. The months were then compared for equal periods of time, and the percentage of injuries during these equal periods forms the basis of comparison.

TABLE No. 7.—*Injuries arranged according to months.*

Month.	Average number of men employed.	Number of injuries.	Percentage of injuries based on the number of working days.
January	3,060	317	10.2
February	3,085	280	9.9
March	3,097	340	10.4
April	3,114	328	10.1
May	3,061	367	11.9
June	3,143	394	12.5
July	3,165	372	12.1
August	3,238	415	12.5
September	3,279	410	13.3
October	3,323	435	12.5
November	3,377	527	15.9
December	3,482	528	14.5

The average number of men employed during January was 3,060, the number of injuries 317, and the percentage of injuries 10.2. The average number of men employed during February was 3,085, the number of injuries 280, and the percentage of injuries 9.9. During March the average number of men employed was 3,097, the number of injuries 340, and the percentage of injuries 10.4. During April the average number of men employed was 3,114, the number of injuries 328, and the percentage of injuries 10.1. May shows the average number of men as 3,061, the number of injuries 367, and the percentage of injuries 11.9. June shows the average number of men as 3,143, the number of injuries 394, and the percentage of injuries 12.5. July shows the average number of men as 3,165, the number of injuries 372, and the percentage of injuries 12.1. August shows the average number of men employed as 3,238, the number of injuries 415, and the percentage of injuries 13.5. For September the average number of men employed was 3,279, the number of injuries 410, and the percentage of injuries 13.3. For October the average number of men employed was 3,323, the number of injuries was 436, and the percentage of injuries 12.5. For November the average number of men employed was 3,377, the number of injuries was 527, and the percentage of injuries 15.9. For December the average number of men employed was 3,482, the number of injuries was 526, and the percentage of injuries 14.5.

Chart No. 3 shows the percentage of injuries for each month as represented by the solid line and the average number of men employed for each month as represented by the dotted line. It is seen that the percentage of injuries remained quite constant for the first four months but showed a fairly marked rise for the last eight months. It is noted that the average number of men employed increased gradually from January to December, the only break in the upward curve being in May. In other words, new employees were being taken on during this time so that the average number of men employed increased from 3,060 in January to 3,482 in December, a rise of 422 in the average complement. The actual number of new men employed during this period was somewhat greater than this figure, as some of the older employees who dropped out during this period and whose places were filled would make the rise in the number of new men more marked than appears on this chart. It is believed that the employment of these new men during the year is responsible to a large extent for the general rise in the percentage of injuries for the last eight months. We have shown that the percentage of injuries is markedly higher during the first six months of employment and decreases as the length of time employed increases. However, it is not to be inferred that this is the only factor concerned in the increase. That climatic conditions have a bearing on

the injury rate can not be doubted. It has been a matter of general comment at the yard dispensary that on overcast, gloomy, depressing days we might look for a goodly number of accidents. Nor is this to be explained on the basis of inadequate illumination in the shops, as the lighting facilities, both artificial and natural, are considered good. We may safely say that the hours of sunshine, temperature, rainfall, and humidity all have a bearing on the injury rate.

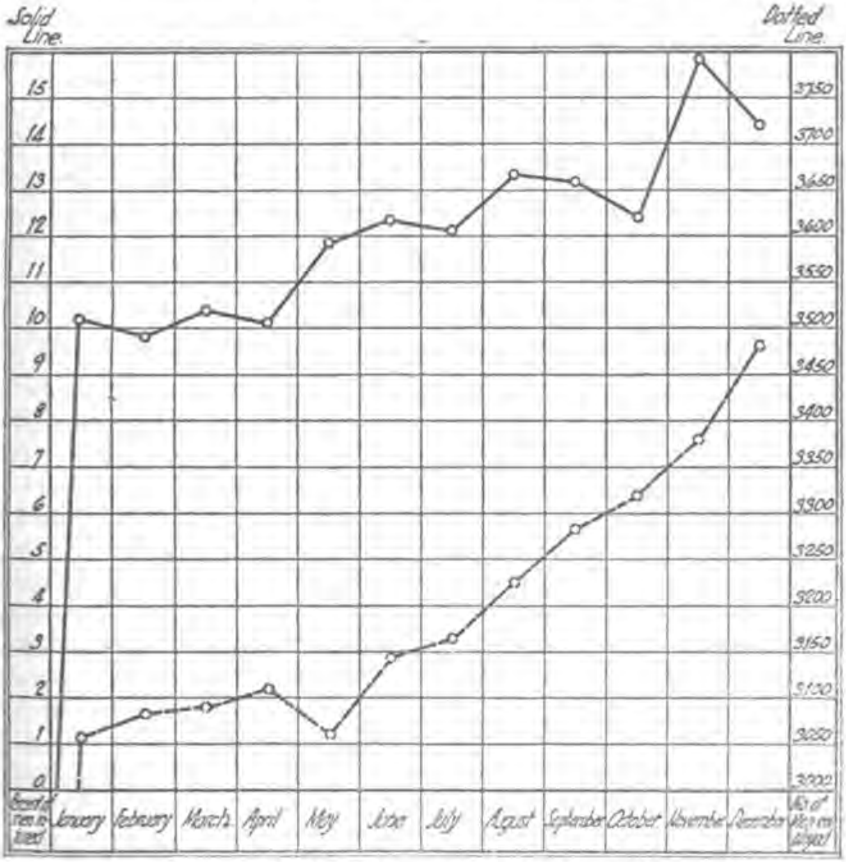


CHART No. 3.—Injuries arranged according to months.

Table No. 8 shows the number of injuries occurring for each day of the week for the two-year period. This shows comparatively little variation during the week. Monday shows 779 injuries and compares well with other days. Tuesday shows 829 injuries, the highest for any day. Wednesday shows 790 and Thursday 778. Friday shows the second highest, the number of injuries being 824. Saturday shows 685, which low figure is no doubt due to the number of holidays and half holidays occurring on this day. During the three summer months Saturday was a half holiday for the workmen. Sunday

shows 25 injuries, as only a few men are employed, and the number of injuries is correspondingly low. This table shows the day of the week as being a relatively slight factor in the occurrence of injuries. Monday has usually been considered a bad day for accidents, and this was the principal reason for classifying the injuries according to days. We see, however, that Monday stands very well as compared with other days, that Tuesday and Friday show the highest injury rate, but that the actual number of injuries shows slight variation throughout the week.

TABLE No. 8.—*Injuries arranged according to days of the week.*

Day injured:	
Monday	779
Tuesday	829
Wednesday	790
Thursday	778
Friday	824
Saturday	685
Sunday	25

Table No. 9 shows the injuries classified according to the time of day they occurred and the percentage of injuries for each two-hour period throughout the day. The men are divided into three eight-hour shifts, of which by far the largest and most important is the 8 a. m. to 4.30 p. m. shift. From 8 a. m. to 10 a. m. there occurred 1,085 injuries, which was 28 per cent of the total number received by the shift. From 10 a. m. to 12 noon there occurred 1,016 injuries, which was 26 per cent of the total number received. From 12 noon to 2 p. m. there were 816 injuries, or 21 per cent of the total. From 2 p. m. to 4 p. m. there were 791 injuries, or 20 per cent of the total. From 4 p. m. to 4.30 p. m. there were 198 injuries, or 5 per cent of the total number. We see here that the highest percentage of injuries occurs in this shift during the first two hours of work and that the percentage decreases constantly during the remaining periods. The second shift includes all men working from 4 p. m. to 12 midnight. From 4 p. m. to 6 p. m. there occurred 214 injuries, or 31 per cent of the total. From 6 p. m. to 8 p. m. there were 182 injuries, or 27 per cent of the total. From 10 p. m. to 12 midnight there were 124 injuries, or 18 per cent of the total. The second shift, as did the first, shows the highest percentage of injuries occurring during the first two hours of work. The second two hours show a drop to 24 per cent, and the third two hours a slight rise to 27 per cent, with a marked drop to 18 per cent during the fourth two hours. The third shift includes all men working from 12 midnight to 8 a. m. From 12 midnight to 2 a. m. there were 28 injuries, or 23 per cent of the total number received. From 2 a. m. to 4 a. m. there were 26 injuries, or

22 per cent of the total number. From 4 a. m. to 6 a. m. there were 21 injuries, or 17 per cent of the total number. From 6 a. m. to 8 a. m. there were 45 injuries, or 38 per cent of the total number. In this shift the highest percentage of injuries occurred during the last hours of work. The first two hours of work showed second highest with a percentage of 23. The second two hours show a drop to 22 per cent, and the third two hours a drop to 17 per cent.

TABLE No. 9.—*Relation of injuries to time of day.*

Time of day injured.	Number of injuries.	Percentage of men injured.
8 a. m. to 10 a. m.	1,085	28
10 a. m. to 12 noon	1,016	26
12 m. to 2 p. m.	816	21
2 p. m. to 4 p. m.	791	20
4 p. m. to 4.30 p. m.	198	5
4 p. m. to 6 p. m.	214	31
6 p. m. to 8 p. m.	165	24
8 p. m. to 10 p. m.	182	27
10 p. m. to 12 m.	124	18
12 m. to 2 a. m.	28	23
2 a. m. to 4 a. m.	26	22
4 a. m. to 6 a. m.	21	17
6 a. m. to 8 a. m.	45	38

Viewing all three shifts as a whole we find that out of a total of 4,711 injuries there were 1,327, or 28 per cent, which occurred during the first two hours of employment. No doubt if the working-day were increased to 10 or 12 hours we would find the percentage of injuries rising toward the end of the day and a curve of that kind would seem to indicate that the fatigue element was being brought to play. However with the eight-hour day we find the first two hours the most productive of injuries, and this fact would seem to indicate that this period is the period of adjustment or settling down to the daily task which requires a focusing of the attention on the work to be done, and that during this process of adjustment of the workman to the machine, which occurs daily, he is more susceptible to injury. In our effort at accident prevention this period of the day would bear particular attention.

Table No. 10 shows the average number of men in each of these shifts and the number and the percentage of injuries. The first shift of 8 a. m. to 4.30 p. m. includes 2,613 men who received 3,906 injuries, showing a percentage of 149. The second shift of 4 p. m. to 12 midnight includes 423 men who received 685 injuries, showing a percentage of 162. The third shift of 12 midnight to 8 a. m. includes 164 men who received 120 injuries, showing a percentage of 73. The second shift shows the highest percentage of injuries and the third shift the lowest. The character of work performed by them varies considerably and will account at least to some extent for the differ-

ence in the percentage of injuries. During the 8 a. m. to 4.30 p. m. shift, all departments are running, including bench work, grinders, machine and metal workers. During the 4 p. m. to 12 midnight shift the force of men decreases from 2,615 to 423. The bench work, which involves comparatively slight risk, is discontinued and the machine work, including the high-speed machines, where the risk is somewhat greater, is continued. During the 12 midnight to 8 a. m. shift the number of men drops to 164 and the work consists mainly of heavy slow-speed machine work, which is comparatively less hazardous.

TABLE No. 10.—*Relation of injuries to working shift.*

Shifts of men.	Average number of men employed.	Number of injuries.	Percentage of men injured.
8 a. m. to 4.30 p. m.	2,615	3,906	149
4 p. m. to 12 midnight	423	685	162
12 midnight to 8 a. m.	164	120	73

Table No. 11 shows all employees who received injuries classified according to the number of injuries each received. We see that during this 2-year period there were 1,060 men who received 1 injury. Two injuries each were received by 530 men, and 261 men received 3 injuries each. The number of men receiving 4 injuries was 139. Those receiving 5 injuries each numbered 76. Those receiving from 5 to 10 numbered 96. Those receiving over 10 injuries numbered 16. It is believed that such a classification of the men as this will be of great benefit in our efforts at accident prevention. It becomes apparent at once that the susceptibility of men to injury differs markedly, as the character of work performed in itself is not enough to account for this difference. For instance, if we consider the last three lines of Table No. 11 we find that 188 men received 1,252 injuries, which is an average of over six to a man. In other words, 5.8 per cent of the average complement received 26.5 per cent of the total number of injuries. The 16 cases showing over 10 injuries per man were made the subject of special inquiry, and the results of this inquiry appear later in the paper.

TABLE No. 11.—*Number of injuries received per man.*

	Injuries.
1	1,060
2	530
3	261
4	139
5	76
6 to 10	96
10 and over	16

Table No. 12 shows the nature of the injuries received. We find that there were 1,259 lacerations of all grades and that this was the most frequent injury received. Next in frequency were contusions, which numbered 871. Foreign bodies in the eye come third in frequency, causing 680 of the total number of injuries. Incisions numbered 558, abrasions 480, and punctures 372. There were 232 burns of varying degrees of severity. Sprains numbered 166, and there were 93 fractures during this 2-year period.

TABLE No. 12.—*Nature of injuries.*

Lacerations	1,259
Contusions	871
Foreign body in eye	680
Incisions	558
Abrasions	480
Punctures	372
Burns	232
Sprains	166
Fractures	93

Table No. 13 shows all injuries classified according to their location. Injuries to the upper extremities numbered 2,988, or 63 per cent of the total number received. Injuries to the eyes numbered 742, or 16 per cent of the total number. There were 527 injuries to the lower extremities, which was 11 per cent of the total. Injuries to the head numbered 319, or 7 per cent of the total number. Injuries to the lumbar region numbered 70, or 1.5 per cent of the total number. There were 31 injuries to the chest, or 0.7 per cent of the total number. Hernias numbered 21, or 0.6 per cent of the total number. There were 13 injuries to the abdomen, or 0.2 per cent of the total number.

TABLE No. 13.—*Injuries arranged according to location.*

Location of injuries.	Number.	Percentage.	Location of injuries.	Number.	Percentage.
Upper extremities	2,988	63	Lumbar region	70	1.5
Eyes	742	16	Chest	31	.7
Lower extremities	527	11	Hernia	21	.6
Head	319	7	Abdomen	13	.2

Chart No. 4 shows the percentage of injuries for each location. This chart gives us valuable information as to what parts of the body are most exposed or most susceptible to injury. That 63 per cent of the total number of injuries occurred to the upper extremity is rather remarkable and is a good point to keep in mind in our efforts at safeguarding the workmen. The majority of these injuries to the upper extremity involved fingers or hands, and there can be no doubt that this part of the anatomy is the most exposed to injury

and requires the most safeguarding. Exposed gears, cogs, saws, belts, and fans are a constant menace and take immediate advantage of the inexperienced or careless operator as well as of the experienced man unless he is constantly on the alert to avoid them. We find not

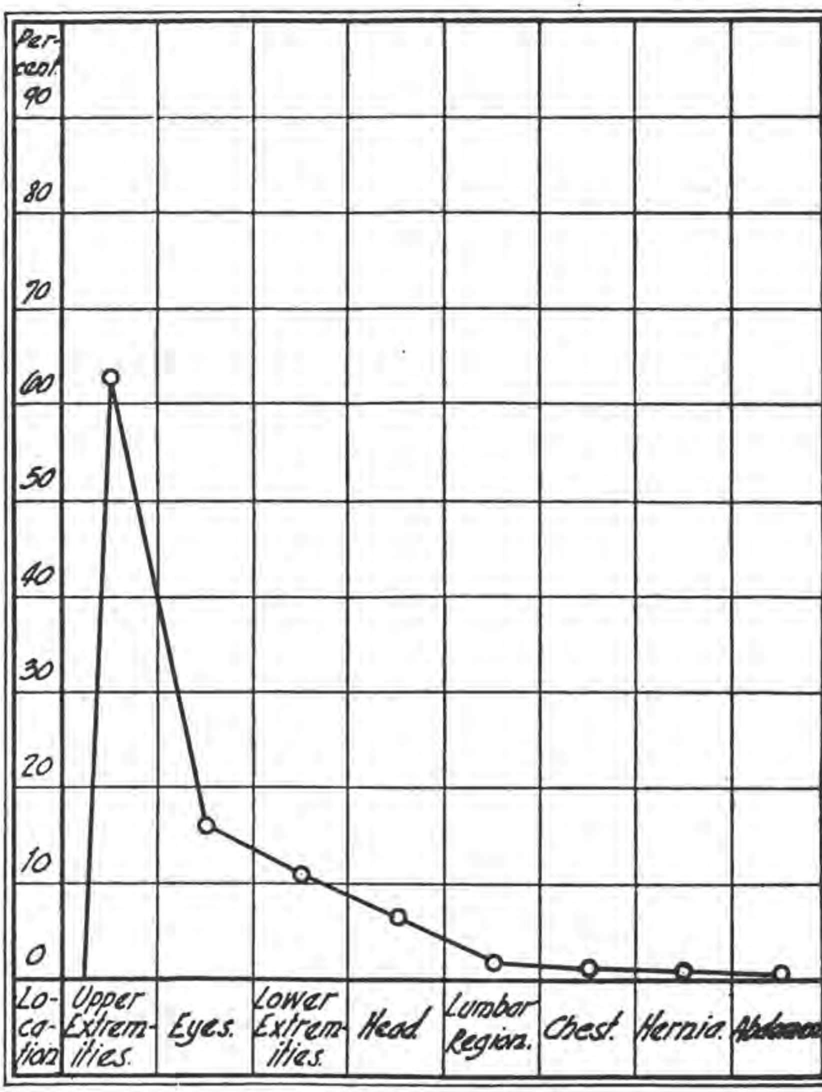


CHART No. 4.—Location of injuries.

infrequently that after working with a machine for many years and mastering every detail of its mechanism and operation, there is a tendency on the part of the workman to regard his machine with less respect. In other words, the ability of the machine to do him per-

sonal injury becomes underrated and as a result he arrives at a stage where his susceptibility to injury is greater. The practice of many large manufacturing establishments of placing warning signs in conspicuous places about the shop and of painting dangerous parts of machinery with warning colors is regarded as an excellent procedure and one which has a definite place in the general campaign toward safety. A red ball painted on a white background is used in many large manufacturing establishments as a danger signal.

Injuries to the eyes were second in frequency, amounting to 16 per cent of the total. It is believed that here is a field where efforts at accident prevention will meet with excellent results. The danger of flying particles of steel, emery, brass, and other foreign particles finding lodgment in the eye is very great. That these injuries can be prevented to a large extent by the use of goggles is evident. It appears hard to get the workmen to make use of the goggles. They say that it is difficult to do close work while wearing goggles and that they interfere with accurate and precise workmanship. No doubt with the usual method of providing goggles this is true to a large extent. The goggles are furnished all of the same pattern, size, and shape, and are issued to the men without fitting them individually. Furthermore, it is only a matter of a few weeks until the lens becomes specked with particles of steel or brass which are usually hot and upon striking the glass becomes embedded and interfere with vision. It is believed that the objection of the men to wearing goggles would be overcome to a large extent if each man was fitted individually and if extra lenses were provided in sufficient quantities so that the old ones could be discarded when they become disfigured by flying chips. If the cornea of a grinder who has worked at his trade for many years be examined with a magnifying glass, very frequently we will find numerous minute particles of steel embedded in the cornea, which seem to cause no inconvenience except in cases where they are so numerous as to cause some dimness of vision. The goggles to be effective must fit closely and still allow the air to circulate. A screen along the outer border with small perforations and fitting snugly to the orbital margin with a broad band along the inner border would accomplish this result. It is believed that 90 per cent of the eye injuries could be eliminated in this way.

The lower extremities rank third in order of frequency of injuries, receiving 11 per cent of the total number, the most usual method of injury being through falling objects. Injuries to the head rank fourth and were caused in large measure by striking against projecting or overhanging objects. Injuries to the lumbar region were mostly of the nature of sprains or wrenches of the muscles due to lifting or slipping. There were 21 hernias during this period, which

figure is considered a high proportion. The injuries to the abdomen numbered 13, mainly of the nature of contusions.

Table No. 14 shows the total number of injuries causing loss of time, divided into classes according to the length of time lost. The total number of injuries causing loss of time was 443. Those causing loss of from 1 to 6 days number 217. Injuries causing loss of from 7 to 14 days numbered 24. There were 118 injuries causing loss of from 15 to 29 days. Injuries causing loss of from 30 to 59 days numbered 49. There were 14 injuries causing loss of from 60 to 89 days. Three injuries caused loss of from 90 to 119 days, and 4 caused loss of from 120 to 179 days. There were 5 injuries causing loss of from 180 to 269 days, and 1 injury causing loss of from 270 to 364 days. There were 8 injuries causing loss of 365 days or over, including those resulting in death. These eight cases were investigated, and the result appears in separate tables later in the paper.

TABLE No. 14.—*Number of injuries causing loss of time in days.*

Injuries causing loss of—	
1 to 6 days	217
7 to 14 days	24
15 to 29 days	118
30 to 59 days	49
60 to 89 days	14
90 to 119 days	3
120 to 179 days	4
180 to 269 days	5
270 to 364 days	1
365 days	8
Total number of injuries causing loss of time	443

Chart No. 5 shows the actual number of injuries causing loss of time and the number of days lost in each class as represented by the solid line. In the first class of from 1 to 6 days fall 217 injuries, or practically one-half of the total number. The majority of these cases were incapacitated for less than 3 days. The second class from 7 to 14 days shows a marked drop to 24. These first two classes of injuries, as they were incapacitated for less than 15 days, did not receive compensation. The third class of injuries which caused loss of from 15 to 29 days, shows a sharp rise to 118. It is here that the workmen's compensation act begins to be applied and there can be little doubt that this fact accounts for the low curve in the second class and the sharp rise in the third. The 24 cases falling in class 2 lost pay during their absence and no doubt suffered inconvenience as a result. Those falling in class 1 also lost their pay, but in the great majority of cases the period lost was 1 or 2 days and was covered in many instances by leave with pay to which the employee was en-

titled. For these reasons the desire to avoid falling in the second class is very great and either the workman goes back to work after 1 or 2 days' disability or if he passes the 7-day period he also passes the 14-day period. In cases where the disability lasted for 12 or 14 days he would suffer much inconvenience and possibly impose hardship upon his family if he failed to pass the 15-day period, and for this reason there is the tendency to allow these cases the full 15 days.

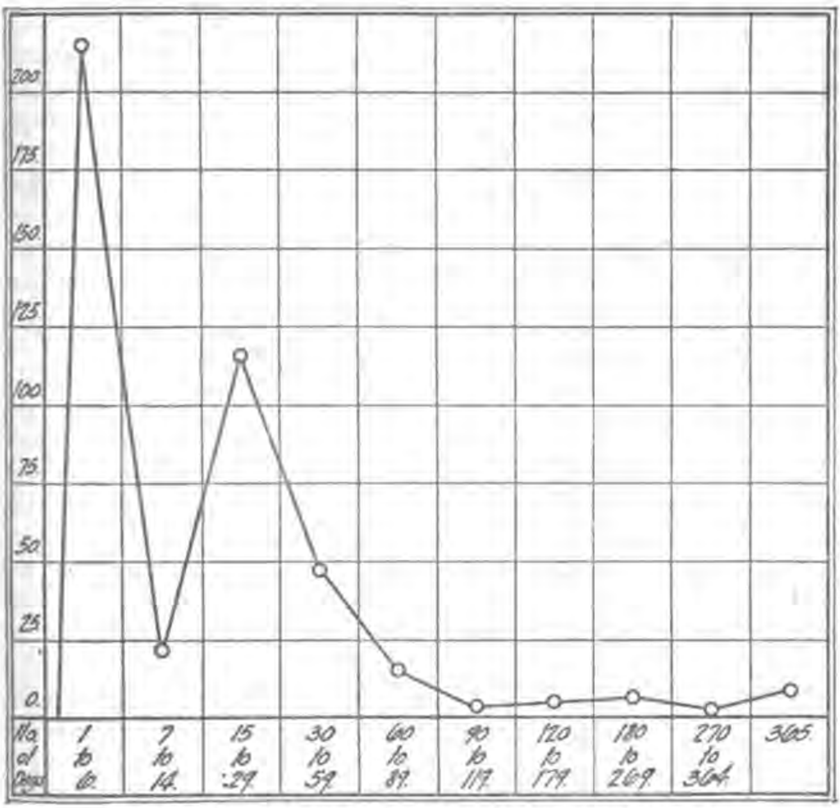


CHART No. 5.—Number of injuries causing loss of time in days.

Table No. 15 shows the injuries causing disability for more than one year. There were three such cases and each was investigated and the findings summarized. Case No. 1 was 42 years of age, married, white, employed for 13 years, and at the time of injury was assigned to west gun-carriage shop. At 2 p. m. on a Friday in April, 1914, while engaged in chipping castings, his overalls caught on a sharp edge of the casting and he stumbled and fell, fracturing the tibia and fibula of his left leg. He had injured this leg several years previously and developed an osteomyelitis which necessitated an operation and the removal of some bony tissue. As a result of this his

leg showed a curving with the convexity outward, and it required only a comparatively slight force to cause the fracture. He was sent to a hospital and every means taken to secure a good result. However, the broken bones showed slight tendency to unite, and at the end of a year he was still unable to return to work. We may say of this case that owing to weakness of the bones of the left leg he was predisposed to injury, and that such injury when it did occur had a far greater effect on him than it would have produced in a normal individual. Case No. 2 was 47 years of age, married, colored, and employed for 18 months as a laborer in the public works department. At 11.30 a. m. on a Tuesday in July, 1914, while stacking lumber, he fell, suffering a contusion of the right forearm. As a result he developed an osteomyelitis of the bones of the right forearm which incapacitated him, and at the end of a year he was still unfit for work. This case illustrates the point made earlier in the paper that an injury, which at the time of occurrence may appear trivial and of small consequence, may later develop into a serious if not permanent disability. Failure to report this injury promptly, owing to its seemingly mild character, caused much inconvenience and time loss to all parties concerned.

Case No. 3 was 68 years of age, single, white, and employed for 10 years. At 11.58 a. m. on a Tuesday in December, 1914, while employed as a helper in the pattern shop and engaged in boring battens for powder boxes, he stepped on a pile of lumber, slipped, and fell, fracturing the neck of his left femur. Union of the broken bone appeared to be a very slow and tedious process in his case and at the end of a year he was still unable to return to work. In this case his age and general physical condition were contributing factors toward his disability.

Table No. 16 shows the injuries resulting in death and a summary of each case. There were five cases in this class and a brief history of each case is given.

Case No. 1 was 38 years of age, married, white, and employed for 10 years. At 9.15 a. m. on a Saturday in January, 1914, while engaged as a helper in the gun shop, he was assisting in driving a key from a bit. The hammer used by another workman who was doing the driving suddenly flew off the handle, striking him on the head. He appeared dazed for a few minutes but insisted on continuing work. Three or four days following the injury he began to complain of headache, vertigo, and general weakness, which gradually increased. The patient appeared listless, unsteady, and understood little that was going on about him. He gradually became unconscious and was taken to a hospital where a trephining operation was performed. The operating surgeon reported evidence of some hemor-

TABLE No. 15.—*Injuries causing disability for more than 1 year.*

Case No.	Age.	Marital condition.	Race.	Time employed.	Shop.	Nature of injury.	Location of injury.	Time injured.	Character of work.	History of case.
1	42	Married	White	13 years	West gun carriage.	Fracture	Tibia and fibula, left leg.	2 p. m., Friday, April, 1914.	Chipping castings; machinist, third class.	Stumbled and fell when overalls caught on sharp edge of casting; imperfect union of broken bones.
2	47	...do	Colored	18 months	Public works	Contusion	Right forearm	11.30 a. m., Tuesday, July, 1914.	Stacking lumber; laborer.	Fell while piling up lumber and struck forearm; osteomyelitis of bones of right forearm.
3	68	Single	White	10 years	Pattern	Fracture	Left femur	11.58 a. m., Tuesday, December, 1913.	Boring battens for powder boxes; helper.	Stepped on pile of lumber, slipped and fell; fracture of neck of femur.

TABLE No. 16.—*Injuries resulting in death.*

Case No.	Age.	Marital condition.	Race.	Time employed.	Shop.	Nature of injury.	Location of injury.	Time injured.	Character of work.	History of case.
1	38	Married	White	10 years	Gun	Contusion	Head	9.15 a. m., Saturday, January, 1914.	Assisting in driving key from bit; helper.	Struck on head by hammer flying off handle; cerebral hemorrhage.
2	40	Single	Colored	1 month	Public works	Fracture	Skull	8.45 a. m., Saturday, June, 1914.	Tearing down coal-handling plant; laborer.	Lost his balance and fell to ground, about 40 feet; fracture of base of skull.
3	54	Married	White	31 years	Gun	Contusion	Left leg	Wednesday, April, 1914.	Lathe; machinist, first class.	Heavy wrench fell from top of lathe striking calf of left leg; phlebitis, infection, pulmonary embolism.
4	54	...do	...do	17 years	East gun carriage.	Fracture and internal injuries.	Pelvis	12.30 p. m., Tuesday, April, 1915.	Planing machine; machinist, first class.	Planer bed ran off support, crushing pelvis against tool cupboard.
5	75	...do	Colored	8 years	Public works.	Fracture	Tibia and fibula right leg.	4.15 p. m., Thursday, June, 1915.	Excavating for water pipe; laborer.	Heavy coal bucket fell over, striking right leg; infection and gangrene.

rhage and destruction of brain tissue. The patient died a few weeks later but no further report of the case could be had. It is rather difficult to draw conclusions from this case but it appears probable that he suffered a concussion of the brain with possibly slow hemorrhage and destruction of brain substance.

Case No. 2 was 40 years of age, single, colored, and employed for one month as a laborer in the public works department. At 8.45 a. m. on a Saturday in June, 1914, while engaged in tearing down a coal-handling plant he lost his balance and fell to the ground, a distance of about 40 feet. He suffered a fracture of the base of the skull and died the following day.

Case No. 3 was 54 years of age, married, white, and employed for 31 years. He was engaged as a machinist, first class, in the gun shop. On a Wednesday in April, 1914, while working on a lathe, a heavy wrench fell from the top of the lathe, striking the calf of the left leg. The injury appeared slight at the time, but resulted in phlebitis, infection, and death as a result of pulmonary embolism. This is another instance of an apparently slight injury with grave results.

Case No. 4 was 54 years of age, married, white, and employed for 17 years. He was engaged as a machinist, first class, in the east gun-carriage shop. At 12.30 p. m. on a Tuesday in April, 1915, while running a planer, the planer bed ran off the support, pinning him against a tool cupboard and crushing the pelvis. It appears that he had his back toward the planer at the time and had no opportunity to avoid the planer bed when it continued to come toward him instead of reversing automatically as it was supposed to do.

Case No. 5 was 75 years of age, colored, married, and employed for eight years. He was engaged as a laborer in the public works department. At 4.15 p. m. on a Tuesday in June, 1915, while excavating for water pipe, a heavy coal bucket fell over, striking his leg and fracturing both tibia and fibula. Owing to his age and rather poor physical condition the site of injury became infected and gangrene developed. His leg was promptly amputated, but death occurred the following day.

Considering the eight cases of Tables 15 and 16 together, we see that four of them were injured by falling, three were struck by falling objects, and one injured by machinery. Only one of these injuries was caused by power-driven machinery, and the remaining seven were the result of falls or falling objects. While the injuries caused by power-driven machines can be prevented in large measure by various protective devices, those due to falls and falling objects and the various kinds of hand labor are not so easily guarded against, and depend more on the intelligence, quickness, and accuracy of the individual workman for their prevention.

Table No. 17 shows the results of the examination of the cases having received over 10 injuries each. Of the 16 men in this class, 2 were not available for examination. Each case was examined physically, and also given a series of tests to determine the speed and accuracy of their movements. First, each man was told to place as many dots as he could on a sheet of paper by means of tapping with a pencil for 15 seconds. After a rest of 15 seconds, he repeated this procedure, the results being recorded in each case. Next he was asked to place a dot in each of 100 centimeter squares as rapidly and accurately as possible, the maximum time required and the accuracy being recorded. He was then given another 100 square drawing, and asked to place a dot in each square at each beat of the metronome, which was set at one beat per second. This procedure was repeated with the metronome set at two beats per second, and again with the metronome set at four beats per second, and the accuracy of movement noted in each case. Each workman was then given a physical examination, and his age, race, marital condition, length of time employed, and character of work were noted. The number and character of his injuries and the total number of days lost as a result of such injuries were also noted.

TABLE No. 17.—*Result of examination of cases having received over 10 injuries.*

Case.	Tapping, 15 seconds.		Maximum time.		Accuracy of movement.			Physical examination.
	A.	B.	Seconds.	Accuracy.	1 per second.	2 per second.	4 per second.	
				P. ct.	P. ct.	P. ct.	P. ct.	
A	88	80	42	90	99	100	64	Normal.
B	94	92	34	91	100	100	84	Do.
C	88	110	30	86	99	100	88	Marked defective hearing.
D	109	120	39	95	100	97	61	Defective vision.
E	84	88	28	91	100	100	92	Normal.
F	87	84	42	98	100	98	60	Albuminuria.
G	101	101	30	99	100	98	84	Slight defective vision.
H	88	101	35	90	100	96	69	Normal.
I	98	96	36	98	100	99	76	Albuminuria.
J	88	82	37	94	100	97	80	Defective vision and hearing.
K	86	84	40	100	100	100	62	Normal.
L	100	105	26	100	100	100	95	Defective vision.
M	88	85	37	95	100	99	70	Albuminuria.
N	84	82	25	88	100	100	83	Defective vision.

Table No. 18 shows the relative ranks of these cases according to the order-of-merit method. Each case was given a number according to his relative position in each test. Thus case D ranks 1 in the first tapping test. In filling in the squares, case N ranks first in the maximum time required. Where more than one obtained the same result, the average standing was assigned to each. In summing up the results, all those obtaining a standing above 7.5, which is the figure midway between the two extremes, were considered above the average

of this group and given a plus in that column. All below this standing were given a minus in that column, and the results of this comparison appear in the columns of Table No. 21 under the respective headings of "Rapidity" and "Accuracy."

Case A was 22 years of age, white, single, and employed for five years. During the past two years he was engaged in lathe and bench work. Physical examination showed nothing abnormal. He had received 11 injuries, of which 5 were injuries about the eyes, 2 were injuries to fingers, 3 to wrists, and 1 to thigh. The total number of days lost was two. The order-of-merit method shows that he is below the average in both speed and accuracy. In all three tests he fell below the average, receiving a −3 in rapidity, and in the four accuracy tests he was below the average in three. We may say of this case that he is relatively slow of action and inaccurate in movements, which inaccuracy becomes particularly marked when he attempts to speed up.

TABLE No. 18.—*Relative ranks according to order-of-merit method.*

Case.	Tapping, 15 seconds.		Maximum time.		Accuracy of movement.			Rapidity.	Accuracy.
	A.	B.	Seconds.	Accuracy.	1 per second.	2 per second.	4 per second.		
				P. ct.	P. ct.	P. ct.	P. ct.		
A	8	14	13.5	12	13.5	4	10	−3	−3
B	5	7	6	10.5	8.5	4	2.5	+3	−1
C	3	2	4.5	14	13.5	4	14	+2	−3
D	1	1	11	6.5	6.5	12.5	12	+2	−2
E	13.5	8	3	10.5	6.5	4	2	+1	−1
F	11	10.5	12.5	5.5	6.5	10.5	9	−3	−2
G	2	4.5	4.5	3.5	6.5	10.5	2.5	+3	−1
H	8	4.5	10	3.5	6.5	14	8	+1	−2
I	4	6	7	5.5	6.5	8.5	6	+3	−1
J	8	12.5	8.5	9	6.5	12.5	13	−3	−2
K	12	10.5	12	1.5	6.5	4	11	−3	−1
L	3	3	2	1.5	6.5	4	1	+3	+4
M	8	9	8.5	6.5	6.5	8.5	7	−3	−1
N	13.5	12.5	1	13	6.5	4	5	+1	−1
	7.5	7.5	7.5	7.5	7.5	7.5	7.5		

Case B was 33 years of age, white, single, and employed for 11 years. During the past two years he was engaged in annealing and steel foundry work. Physical examination revealed nothing abnormal. He had received 11 injuries, of which 5 were wounds of the fingers and hands, 4 were contusions of toes and ankles, 1 was a burn of face, and 1 a foreign body in eye. He lost no time as a result of these injuries. The order-of-merit method shows that in all three speed tests he was above the average for this group, receiving a +3 under "Rapidity." In the four accuracy tests he was below the average in one, which was in accuracy in filling in the 100 squares as rapidly as possible. We may say in this case that he works rapidly, but shows tendency to inaccuracy when working against time. His position as steel worker is considered to be some-

what more hazardous and to expose him to injury more frequently than the average employee.

Case C was 38 years of age, white, married, and employed for 11 years. During the past two years he was employed as a chipper and cold-saw operator. Physical examination showed defective hearing of both ears. He was unable to hear the whispered voice, or the watch tick on contact, and could hear the spoken voice at only 1 foot for each ear. He had received 18 injuries, of which 13 were wounds of the fingers and hands, 2 were wounds of the forearm, 1 a contusion of ankle, 1 a foreign body in eye, and 1 a fractured toe. He lost 25 days as a result of injury. The tests employed showed that this man was above the average for this group in two of the three speed tests, and was below the average in three of the four accuracy tests. In fact, he received the lowest rating of the group in the accuracy of filling the 100 squares as quickly as possible, and also in the accuracy with which he filled the squares at four movements per second.

This case stands well regarding rapidity of movement, but very low as regards accuracy of movement, which fact, together with his marked defect in hearing, would account for his frequent injury. That deafness is a predisposing factor to injury can not be doubted in an environment where a warning of any sudden danger depends quite as frequently upon the sense of hearing as upon vision.

Case D was 34 years of age, white, married, and employed for 10 years. He was employed as an air-drill operator, chipper, and in the boiler shop. Physical examination shows 3/20 vision for each eye. He had received 11 injuries, of which 8 were wounds of the fingers and hands, 2 were wounds of the legs, and 1 a wound of the cheek. In tests for speed he was above the average in two of the three tests and ranked first in the tapping test on both trials. In accuracy of movement he was above the average in two. In both the two movements per second and the four movements per second he fell below the average. We may say of this case that in rapidity of movement he is excellent, but shows a tendency to become inaccurate when the rate of movement is increased. His defective vision, which is quite marked, is considered to be a contributing factor toward his frequent injuries.

Case E was 18 years of age, white, married, and employed for 18 months. He was employed as an apprentice and engaged in bench work. Physical examination revealed nothing abnormal. He received 11 injuries, consisting of wounds of the fingers and hands, and lost no time as the result of injury. His speed tests show him below the average in two of the three tests, but in accuracy he is above the average in three of the four tests. We may say that he is slow but accurate in his work, and that he does not lose this accuracy when speeded up. His frequent injuries are no doubt due to his age,

short length of time employed, and his rate of apprentice, all of which we have shown are predisposing factors.

Case F was 22 years of age, white, married, and employed for 5 years. His work was mainly on the lathe, drill press, and bench. Physical examination showed albuminuria. He received 10 wounds of the fingers and hands, 1 wound of the heel, and 1 contusion of the nose. His tests on speed showed him below the average in all three and below the average in two of the four accuracy tests. This case shows marked slowness of movement and some inaccuracy, which is especially marked when speed is attempted.

Case G was 31 years of age, white, married, and employed for 10 years. He was a casting cleaner, chipper, and helper in the foundry. Physical examination showed slight defective vision of right eye. He received 11 wounds, of which 9 were foreign bodies in the eye, 1 a laceration of scalp, and 1 a sprain of right forearm. No time was lost as a result of these injuries. His speed tests showed him above the average in all three tests, and he was above the average in three of the four accuracy tests. We may say of this case that in speed and accuracy of work he is above the average for this group. His frequent injuries, which are mainly to the eye, were due to flying chips to which his occupation particularly exposes him, and no doubt could be prevented by the use of properly fitting goggles.

Case H was 34 years of age, white, single, and employed for 11 years. He was engaged in lathe work. Physical examination showed nothing abnormal. He received 11 injuries, of which 5 were wounds of the fingers and hands, three were wounds of the leg, 2 were foreign bodies in the eye, and 1 a burn of eyelids. He lost two days as a result of injury. The three speed tests showed him below the average in two, and he was below the average in two of the four accuracy tests. We may say of this case that he is comparatively slow and is inaccurate when speeding up.

Case I was 20 years of age, white, married, and employed for 5 years. He was engaged on a milling machine, lathe, shaper, and as tool grinder. Physical examination showed marked albuminuria. He received 15 injuries, of which 10 were wounds of the fingers and hands, 1 sprain of ankle, 2 were foreign bodies in the eye, 1 a contusion of knee, and 1 a contusion of back. His speed tests showed him above the average in all three, and he was above the average in three of his four accuracy tests. He lost three days as a result of injury. This case shows up well in his speed and accuracy tests. The albuminuria, if constant, would certainly be a factor in lowering his vitality and predisposing him to injury, while the character of his work exposes his fingers and hands to frequent injury.

Case J was 34 years of age, white, married, and employed for 13 years. He was engaged as a casting cleaner and cold-saw oper-

ator. Physical examination showed defective vision and hearing. In the speed tests he was below the average in all three, and was below the average in three of the four accuracy tests. He received 12 injuries, of which 4 were wounds of fingers and hands, 5 were foreign bodies in the eye, 1 a burn of eye, 1 an abrasion of forehead, and 1 an abrasion of leg. This case showed slowness and inaccuracy of movement, which, together with his defective vision and hearing, would predispose him to injury. His frequent injuries could no doubt be lowered by the use of goggles.

Case K was 22 years of age, white, married, and employed for 5 years. He was engaged as a tool maker, shaver, grinder, and on lathe work. Physical examination showed nothing abnormal. He received 15 injuries, of which 12 were foreign bodies in the eye, 1 was a burn of the inner canthus of eye, and 2 were wounds of the fingers. He lost two days as a result of injury. His speed tests showed him below the average in all three, but in accuracy he is above the average in three of the four tests. This case showed that he is relatively slow but accurate in his movements. His character of work renders him particularly liable to eye injuries, and with the use of properly fitting goggles his frequent injuries could be prevented.

Case L was 41 years of age, white, married, and employed for 17 years. He was engaged in preparing pack bits for boring out guns. Physical examination showed marked defective vision. He received 11 injuries, of which 8 were wounds of fingers and hands, 1 a foreign body in the eye, 1 a contusion of lip, and 1 abrasion of foot. In all tests for speed and accuracy this case was above the average and heads the entire group in this respect. His frequent injuries can no doubt be attributed in a large measure to his defective vision.

Case M was 17 years of age, white, single, and employed for 10 years. He was engaged as an apprentice on a lathe, milling machine, and in general machine work. Physical examination showed albuminuria. He received 12 injuries, of which 10 were wounds of the fingers and hands, 1 a sprain of left groin, and 1 a contusion of mastoid region. He lost two days as the result of injury. His speed tests showed him below the average in all three, but in accuracy he is above the average in three of the four tests. This case shows slowness but accuracy of movement. His position of apprentice, his age, and length of time employed all place him in classes most susceptible to injury, as we have shown in previous tables, and the albuminuria, if constant, is a factor in lowering his vitality and efficiency.

Case N was 41 years of age, white, married, and employed for three years. He was employed in furnace room and about acid tub. Physical examination showed moderate defective vision of both eyes. He received 11 injuries, of which 10 were wounds of the hands and

1 of the foot. His speed tests show him below the average in two, and his accuracy tests show him above the average in three of the four tests. We may say of this case that he is relatively slow but accurate, and that his defective vision is a contributing factor toward his frequent injuries.

Tables 19, 20, and 21 show the shops arranged according to the average number of men employed, the number of days lost per man from each shop, and the percentage of injuries in each shop. The work was divided among 27 different shops, and the character of work performed and the types of machinery used were noted in each shop.

TABLE No. 19.—*Shops arranged according to the average number of men employed.*

Shops.	Average number of men employed.	Number of injuries.	Percentage of men injured.	Number of days lost.
1. Erecting	263	441	168	[illegible]
2. West gun carriage	253	419	164	1,079
3. Miscellaneous	247	560	227	[illegible]
4. East gun carriage	224	282	125	[illegible]
5. Secondary mount	216	192	89	142
6. Gun	214	233	109	2,137
7. Breech mechanism	199	270	136	345
8. Foundry	193	287	149	1,037
9. Tool	186	301	162	122
10. Pattern	137	137	100	778
11. Sight	124	288	232	[illegible]
12. Cartridge case	109	216	198	[illegible]
13. Public works	108	128	119	1,032
14. Forge	99	120	121	[illegible]
15. Supply	91	99	109	125
16. Hauling	82	81	99	221
17. Model basin and shop	81	61	75	147
18. Outside	77	14	18	......
19. Coppersmith	74	94	127	198
20. Steam power plant	52	48	92	[illegible]
21. Electric power plant	48	44	92	38
22. Gunner's work shop	37	95	257	271
23. Seaman gunner's	37	49	132	68
24. Primer	23	39	170	22
25. Buffing	18	11	61	171
26. Oxyacetylene	3	1	33	......
27. Pneumatic power plant	2	1	50	......

The erecting shop was No. 1 in the average number of men employed, having 263 men. In number of days lost per man this shop ranks eighteenth, there being 405 days lost as a result of injury, or 1.5 days per man. In the percentage of injuries the erecting shop ranks sixth, there being 441 injuries or 168 per cent. The class of work performed in this shop is the erecting of gun mounts for the large-caliber guns, the mounting of the guns, and the manufacture of ammunition hoists. This is very heavy work and involves the use of traveling cranes. Approximately two-thirds of the men are machinists in this shop. Besides this there are about 40 boiler makers and a large number of helpers and laborers. The machines used are mainly planers, slotters, lathes, drill presses, milling and boring machines, and air hammers. About half of the men are engaged in

machine work and the rest in bench and floor work. The boiler makers appear to be the most exposed to injury. The tables show that this shop stands well as to the number of days lost per man but that the percentage of injuries is comparatively high. This large number of slight injuries is due in great measure to flying chips and to hoisting apparatus.

TABLE No. 20.—*Shops arranged according to number of days lost per man.*

Shops.	Average number of men employed.	Number of days lost per shop.	Number of days lost per man.
1. Gun	214	2,157	10.1
2. Public works	108	1,051	9.7
3. Buffing	18	171	9.5
4. Gunner's workshop	37	277	7.5
5. Pattern	137	776	5.7
6. Foundry	193	1,037	5.4
7. Steam power plant	52	250	4.8
8. Forge	99	436	4.4
9. West gun carriage	256	1,079	4.2
10. Cartridge case	109	433	4.0
11. East gun carriage	226	768	3.4
12. Hauling	82	221	2.7
13. Coppersmith	74	186	2.4
14. Model basin and shop	81	147	1.8
15. Seaman gunner's	37	68	1.8
16. Breech mechanism	199	348	1.7
17. Sight	124	208	1.7
18. Erecting	263	405	1.5
19. Supply	91	121	1.3
20. Electric power plant	48	58	1.2
21. Primer	23	22	1.0
22. Miscellaneous	247	223	.9
23. Secondary mount	216	143	.7
24. Tool	186	127	.7
25. Outside	77		
26. Oxyacetylene	3		
27. Pneumatic power plant	2		

TABLE No. 21.—*Shops arranged according to the percentage of injuries.*

Shops.	Average number of men employed.	Number of injuries.	Percentage of men injured.
1. Sight	124	388	313
2. Cartridge case	109	316	290
3. Gunner's workshop	37	95	257
4. Miscellaneous	247	560	227
5. Primer	23	39	170
6. Erecting	263	441	168
7. West gun carriage	256	419	164
8. Tool	186	301	162
9. Foundry	193	287	149
10. Breech mechanism	199	270	136
11. Seaman gunner's	37	49	132
12. Coppersmith	74	94	127
13. East gun carriage	226	282	125
14. Forge	99	120	121
15. Public works	108	128	119
16. Gun	214	233	109
17. Supply	91	99	109
18. Pattern	137	137	100
19. Hauling	82	81	99
20. Steam power plant	52	48	92
21. Electric power plant	48	44	92
22. Secondary mount	216	192	89
23. Model basin and shop	81	61	75
24. Buffing	18	11	62
25. Pneumatic power plant	2	1	50
26. Oxyacetylene	3	1	33
27. Outside	77	14	18

The west gun-carriage shop ranks second in number of men employed, having an average of 256 men. The number of days lost per man was 4.2, placing this shop seventh in this class. The character of the work performed consists in the finishing of gun carriages, mounts, general machine work, and the repairing of machinery. The types of machines used are grinders, drill presses, shapers, slotters, planers, boring mills, lathes, gear cutters, air and electric drills, and electric cranes. About half of the work is machine work, the balance being bench work or work with hand tools. About three-fourths of the men are machinists, the remainder being helpers, apprentices, and laborers. This shop shows a relatively high percentage of injuries and a high average per man of time lost as a result of injury.

The miscellaneous shop ranks third in number of men employed, there being an average of 247 men. The time lost per man was 0.9 day, placing this shop twenty-second on this table, and the percentage of injuries was 227, or fourth on Table 19. The character of work performed is the finishing of gun mounts, parts for torpedoes and torpedo tubes, sights, and wireless apparatus. The types of machines used are mainly lathes, boring mills, drill presses, milling machines, grinders, shapers, planers, and electric cranes. About four-fifths of the men are machinists, the balance being helpers and apprentices. This shop shows a very high rate of injury, but the time lost per man is very low, showing that the injuries as a rule were comparatively slight.

The east gun-carriage shop ranks fourth in number of men employed, there being an average of 226 men. It ranks eleventh in number of days lost, showing a loss of 3.4 days per man. It ranks thirteenth in per cent of injuries, showing 125 per cent. The character of work performed is largely of a heavy nature, such as gun mounts and carriages, and there is very little light or bench work. The types of machinery are lathes, boring mills, planers, slotters, drill presses, shapers, and grinders. There are about 180 skilled men, the balance being helpers and apprentices. This shop shows a fairly low injury rate and also a rather low loss of time per man.

The secondary mount shop stands fifth in number of men employed, there being an average of 216 men. In number of days lost it stands twenty-third, with an average of 0.7 day lost per man. In percentage of injuries it stands twenty-second, there being 192 injuries, or 89 per cent. The character of work performed is mainly the manufacture, assembling, and the making of parts for torpedoes. The character of machinery is chiefly lathes, milling machines, drill presses, slotters, planers, boring mills, turret lathes, and screw machines. The work is about evenly divided between machine and bench work. There are about 35 helpers and apprentices, the re-

mainder being skilled men, mostly machinists. This shop shows a remarkably low rate of injury and loss of time per man.

The gun shop ranks sixth in number of men employed, having an average complement of 214. In number of days lost this shop heads the list, showing an average of 10.1 days lost per man. In percentage of injuries it stands sixteenth, showing 109 per cent. The character of work performed is chiefly of a heavy nature and consists in the boring, shrinking, and rifling of large-caliber guns. Lathes are the chief machines used. There are three electric overhead traveling cranes. About half the employees are skilled, the remainder being helpers and laborers. This shop shows a rather low rate of injury, but in number of days lost per man it heads the list. Two of the injuries in this shop resulted fatally. We may say that although there were comparatively few injuries, they were more apt to be of a serious nature when they did occur.

The breech-mechanism shop ranks seventh in number of men employed, having an average complement of 199 men. In number of days lost it stands sixteenth, showing a loss of time of 1.7 days per man. In percentage of injuries it stands tenth, with a percentage of 136. The character of work performed is mainly making breech plugs for guns. The types of machinery include lathes, planers, milling machines, drill presses, grinders, screw cutters, profilers, slotters, and shapers. About 60 per cent of the work is machine work and the balance bench work. This shop shows a fairly high rate of injury but a relatively low loss of time.

The foundry shop stands eighth in number of men employed, having an average complement of 193 men. In number of days lost it stands sixth, showing a loss of 5.4 days per man. The character of work performed consists mainly of melting and pouring castings and making the molds for this purpose. The class of casting made are mostly steel, bronze, and brass. The work involves melting of the metal, testing it for quality, and pouring it into the molds. After the castings are made they are dressed with hammer and chisel and emery wheels, and the blowholes and sandholes are often electric welded. The workmen of this shop may be divided into the following classes: Molders, who make the molds for castings and cores; approximately half of the men fall into this class. Helpers, who do the general labor work about the shop, hauling sand, working over the sand, carrying mold frames in, and removing castings. Furnacemen, steel workers, and electric welders, apprentices and casting cleaners, who form a comparatively slight per cent of the total force. The machines consist mostly of cold saws, grinders, and electric overhead traveling cranes. This shop shows both a comparatively high injury rate and a high loss of time per man.

The tool shop ranks ninth in number of men employed, showing an average complement of 186. In number of days lost it stands twenty-fourth, showing a loss of 0.7 day per man. In percentage of injuries it stands eighth, showing a percentage of 162. The character of work performed here is mainly the manufacture and repair of tools. The types of machinery used are lathes, milling machines, planers, grinders, and drills. About 75 per cent of the work is machine work and the balance bench work. This shop shows a high injury rate, but a very low loss of time per man. The injuries are mostly due to flying chips of emery and steel, affecting the eyes particularly, and could be materially lessened by the use of properly fitting goggles.

The pattern shop ranks tenth in number of men employed, having an average complement of 137 men. In the number of days lost it stands fifth, showing a loss of 5.7 days per man. In the percentage of injuries it stands eighteenth, having a percentage of 100. The character of work performed is mainly the making of wood patterns and general carpenter work. The types of machines are saws, circular and band, planers, joiners, dovetail and mortise machines, nailers, and borers. The class of employees are mostly pattern makers, joiners, millmen, and woodworkers. This shop shows a comparatively low injury rate but a high rate of time lost. The injuries in this shop are chiefly due to lacerations from saws, which when they occur are apt to cause loss of time.

The sight shop stands eleventh in number of men employed, having an average complement of 124. In time lost it stands seventeenth, showing 1.7 days' loss per man. In percentage of injuries the sight shop heads the list, showing a percentage of 313. The character of work performed is the making of sights for guns and periscopes, telescopic lenses, and the optical repair work. The types of machinery are lathes, planers, shapers, milling machines, drill presses, and grinders. This shop shows a relatively low loss of time per man, but in the per cent of injuries it is higher by considerable margin than any other shop.

The cartridge-case shop stands twelfth in the average number of men employed, having an average complement of 109. In the number of days lost it stands tenth, showing a loss of 4 days per man. In the percentage of injuries it stands second, with the percentage of 290. The character of work performed consists mainly in the making of brass cartridge cases and steel powder tanks. The types of machinery are punch and hydraulic presses and lathes. There is considerable furnace work done here. Two-thirds of the men are helpers, the rest being skilled men, mostly cartridge-case makers. This shop shows a comparatively high loss of time per man and a very high injury rate, being exceeded in this respect only by the

sight shop. The high injury rate here is no doubt influenced by the large percentage of helpers employed, whom we have shown have a high injury rate, and by the character of the work performed.

The public works department ranks thirteenth in number of men employed, having an average complement of 108. In number of days lost it stands fifteenth, with a percentage of 119. The character of work performed is mainly painting, plumbing, bricklaying, the cleaning and repairing of streets, care of railroad tracks, and the general labor work about the grounds and buildings. There is practically no machine work done. About one-third of the men are skilled, including the painters, plumbers, and bricklayers. About two-thirds are laborers, practically all colored. This group of employees shows a moderate injury rate as compared with other shops, but a very high loss of time as a result of injury. There were two injuries which resulted fatally and one which caused disability for over one year, all three occurring among colored laborers. The large percentage of colored employees in this department is an important factor in this large loss of time.

The forge shop stands fourteenth in number of men employed, having an average complement of 99. In number of days lost it stands eighth, showing a loss of 4.4 days per man. In the percentage of injuries it stands fourteenth, showing a percentage of 121. The character of work performed is mainly the forging of steel and blacksmith work. The types of machinery are presses, drop forges, hydraulic hammers, and furnaces. This shop shows a moderate injury rate compared with other shops, but shows a rather high loss of time per man, indicating that many of the injuries resulted in temporary incapacity.

The supply force stands fifteenth in the number of men employed, showing an average complement of 91. In number of days lost it stands nineteenth, showing a loss of 1.3 days per man. In percentage of injuries it stands seventeenth, showing a percentage of 109. The character of work performed is mainly the moving and storing of supplies of all kinds. Besides this, there are a few cold saws, band and circular saws, and an electric crane. The majority of the men are laborers, but there are a few skilled men to operate the saws, and carpenters to look out for the issuing and care of lumber. This shop shows both a low rate of injury and a low loss of time per man. The work involves comparatively slight hazard.

The hauling department stands sixteenth in the number of men employed, having an average complement of 82. In time lost it stands twelfth, showing a loss of 2.7 days per man. In percentage of injuries it stands nineteenth, showing a percentage of 99. The character of work performed is mainly the transportation of supplies to the shops and of the finished product from the shop. The types of

machinery used are steam locomotives, wreckers, and auto trucks. The majority of the men are laborers and helpers. Besides this, there are about 15 men employed as engine tenders and chauffeurs. This department has a fairly low injury rate, but a somewhat higher rate of loss of time per man, although both tables show this shop to compare very favorably with others in both respects.

The model basin and shop stands seventeenth in number of men employed, having an average complement of 81. In time lost it stands fourteenth, showing a loss of 1.8 days per man. In percentage of injuries it stands twenty-third, showing a percentage of 75. The character of work performed here is mainly the manufacture and testing of models and the repair of the yard craft. In the metal shop the types of machines used are lathes, planers, milling machines, drill presses, boring machines, and grinders. The type of machines used in the pattern shop are lathes, band, rip, and circular saws, variety molders, stickers, profilers, planers, and mortise machines. The majority of the men are machinists, joiners, and pattern makers. Besides these there are a few helpers, apprentices, and laborers. This shop shows a moderate loss of time as a result of injury and a very low injury rate.

The outside shop ranks eighteenth in number of men employed, having an average complement of 77. It shows no days lost as a result of injury. In the percentage of injuries it stands twenty-seventh, showing a percentage of 18. The character of work performed is mostly desk or clerical work. There are a few laborers and helpers engaged in the laboratory, blue-print room, and photographers' shop. This shop shows a low percentage of injuries and no loss of time, as the work involves slight risk of injury.

The coppersmith shop ranks nineteenth in number of men employed, having an average complement of 74. In number of days lost it stands thirteenth, showing a loss of 2.4 days per man. In percentage of injuries it stands twelfth, showing a percentage of 127. The character of work performed consists mainly in the manufacture of copper pipe, powder boxes, and articles from sheet copper, tin, and galvanized iron, and repair work on same. About two-thirds of the men are skilled, such as coppersmiths and tinsmiths, and the remainder are helpers and apprentices. The machines consist mostly of drill presses and cutting and breaking machines. This shop shows a moderate injury rate and loss of time rate. Most of the injuries were due to coming in contact with sharp edges of metal or burns due to braising and soldering.

The steam power plant stands twentieth in number of men employed, having an average complement of 52. In loss of time it stands seventh, showing 4.8 days lost per man. In percentage of injuries it stands twentieth, showing a percentage of 92. This shop

is concerned with supplying the entire motive power and heating system of the yard. The class of work is mostly tending furnaces and the repair of steam lines and connections. There are about an equal number of pipe fitters and helpers and four machinists. This shop shows a low injury rate but a high loss of time per man.

The electric power plant stands twenty-first in number of men employed, having an average complement of 48. In loss of time it stands twentieth, showing a loss of 1.2 days per man. In percentage of injuries it stands twenty-first, showing a percentage of 92. The work consists mainly of repairing commutators and other electrical appliances and the installing of all electric machinery. This shop contains the large dynamos supplying electric current to the yard. The repair shop contains a machine lathe, shaper, and drill press. This shop shows a low injury rate as well as a low loss of time per man.

The gunner's workshop ranks twenty-second in the number of men employed, there being an average complement of 37. It ranks fourth in the number of days lost, showing 7.5 days per man. It ranks third in per cent of injury, showing a percentage of 257. The character of work performed here is mainly work on fuses and primers, canvas bags, rigging, painting, sewing, and leather articles. The types of machines used are hydraulic presses, cutting, punching, and sewing machines, and drill presses. About three-fourths of the men are skilled and the remainder helpers and laborers. This shop shows a high injury rate and also a large loss of time as a result of injury.

The seaman gunners' shop ranks twenty-third in number of men employed, there being an average complement of 37. It ranks fifteenth in number of days lost, showing 1.8 days per man. It ranks eleventh in per cent of injuries, showing 132 per cent. The character of work performed here is mostly the manufacture of small and delicate articles, such as parts of torpedoes, electric firing and lighting attachments, and parts of breech mechanisms. The machines used are lathes, milling machines, drill presses, planers, shapers, slotters, and grinders, the bench and machine work being about equally divided. About four-fifths of the men are machinists, the remainder are helpers and apprentices. This shop shows a moderate injury rate and comparatively low loss of time as a result of injury.

The primer shop ranks twenty-fourth in number of men employed, there being an average complement of 23. It ranks twenty-first in number of days lost, showing 1 day per man. It ranks fifth in the per cent of injury, showing 170 per cent. The character of work performed here is the making of primers. Types of machinery used are automatic screw machines. The majority of the men are machinists, the remainder are helpers and apprentices. This shop shows a low loss of time per man, but a high percentage of injuries.

The buffing shop ranks twenty-fifth in number of men employed, there being an average complement of 18. It ranks third in the number of days lost, showing 9.5 days per man, and twenty-fourth in number of injuries, showing 62 per cent. The character of work performed here is mainly the polishing and buffing of metal articles. This shop shows a very high loss of time per man, but a very low rate of injury, which would indicate that accidents when they occur here are apt to be serious.

The oxyacetylene shop ranks twenty-sixth in number of men employed, having an average complement of 3. It shows no days lost as a result of injury. In percentage of injuries it stands twenty-sixth, showing a percentage of 33. The work consists in cutting metal by means of the oxyacetylene flame. This work shows a low injury rate and no time lost as a result of injury.

The pneumatic power plant stands twenty-seventh in number of men employed, having an average complement of two. It shows no time lost as a result of injury. The work consists in keeping up pneumatic power for the yard by means of air-pumping engines. In percentage of injuries it stands twenty-fifth, showing a percentage of 50. This work shows a low injury rate and little hazard.

From a study of the injuries in the various shops, it appears that they may be roughly ascribed to the following causes:

1. Falls.
2. Falling, rolling, and flying objects.
3. Power-driven machinery.
4. Hand tools and simple apparatus.
5. Carrying, lifting, and transportation.
6. Dangerous substances, such as molten metal and electric wires.

Falls were responsible for all three of the injuries causing disability for more than one year and for one of the five fatal injuries. Falling, rolling, and flying objects caused a large percentage of injuries. Falling and rolling objects caused many of the fractures, particularly those of the lower extremities, and caused three of the five injuries resulting fatally. Flying objects caused the great percentage of the eye injuries which form such a large part of the total number of injuries and which may be prevented in great measure by the use of properly fitting goggles.

Power-driven machinery is a fruitful source of injury and one that may be counteracted through various safety devices. The high-speed machines, such as grinders, circular and band saws, and high-speed lathes, are particularly dangerous and require the use of safety devices. The heavy, slow-speed machines, such as planers, shapers, slotters, and slow-speed lathes, are comparatively less hazardous.

Work with hand tools and simple apparatus exposes the workman to frequent injury, mostly of the nature of wounds of the upper extremities, particularly of the fingers and hands, the majority of which are slight and cause no loss of time.

Carrying, lifting, and transportation resulted in a relatively small percentage of injuries and includes muscular strains and sprains due to lifting and carrying.

Contact with dangerous substances, such as molten metal, live wires, and the various caustic solutions, was responsible for a small number of injuries.

As a result of our studies of injuries in the yard we may draw the following conclusions regarding them:

1. The highest percentage of injuries occurred among employees between the ages of 16 and 20 and decreased steadily to those between the ages of 50 and 59, who showed the lowest injury rate, and from this point the percentage of injuries showed a slow but constant rise with advancing age.

2. The colored employees showed a higher injury rate than the white employees although engaged as a rule in less hazardous work.

3. The single employees showed a higher injury rate than the married employees.

4. The injury rate was markedly higher during the first six months of employment and decreased steadily and constantly as the length of time employed increased.

5. The skilled employees showed the lowest percentage of injuries and the helpers and apprentices showed the highest percentage of injuries, with the laborers standing about midway between the two.

6. The injuries reported increased from 67.7 per cent in 1914 to 78.7 per cent in 1915.

7. The percentage of injuries increased during the year, particularly during the last eight months, and showed a direct relation to the number of new employees taken on during this time.

8. The day of the week showed very slight influence on the number of injuries, Monday standing very well compared with other days.

9. With the eight-hour day we find the greatest percentage of injuries occurring during the first two hours of work, with a steady decline for each two-hour period thereafter. It is believed that the first two-hour period is the period of adjustment of the workman to his machine or tool, that this process requires a focusing of the attention on the work to be performed and the inhibition of disturbing thoughts and external stimuli, that this process requires a definite interval of time for its accomplishment, and that during this period of adjustment the workman is more susceptible to injury.

10. The 4 p. m. to 12 midnight shift showed the highest percentage of injuries and the 12 midnight to 8 a. m. shift showed the lowest percentage of injuries, while the 8 a. m. to 4.30 p. m. shift stands between these two and slightly below the 4 p. m. to 12 midnight shift, the difference in the character of work performed by these three shifts accounting in great measure for this difference in rate of injury.

11. Of the 4,711 injuries received by 2,178 men, 1,263 were received by 188 men. In other words, 8.6 per cent of the total number of men who were injured received over 26 per cent of the total number of injuries.

12. The three most frequent injuries received in the order of their frequency were lacerations, contusions, and foreign bodies in the eye.

13. Of the total number of injuries received, 63 per cent were injuries of the upper extremities, 16 per cent were injuries of the eyes, 11 per cent were injuries of the lower extremities, and 7 per cent were injuries of the head.

14. Of the 4,711 injuries received, 443, or 9.4 per cent, caused loss of time. Of these injuries, 217 caused loss of from 1 to 6 days, 24 caused loss of from 7 to 14 days, and 118 caused loss of from 15 to 29 days.

15. Three injuries caused disability for more than one year, and were all the result of falls sustained by the workmen.

16. Five injuries resulted fatally, three being caused by falling objects, one being the result of a fall, and one being caused by machinery.

17. The six shops showing the greatest loss of time per man as a result of injury in the order of number of days lost per man were the gun shop, public works, buffing, gunners' workshop, pattern, and foundry.

18. The six shops showing the highest percentage of injuries in their relative order were the sight, cartridge case, gunners' workshop, miscellaneous, primer, and erecting.

19. It appears that individuals differ greatly in their susceptibility to injury, although engaged in the same class of work, and that this susceptibility to injury varies in the same individual from time to time.

It is believed that the following recommendations will aid in lowering the number of industrial accidents and will help in the general campaign toward safety:

1. That special attention be given the new employee until he becomes thoroughly acquainted with his machine or tool and with his fellow workmen with whom he must cooperate in performing his daily task, and that he be instructed in the risks to which the character of his work exposes him and the manner in which he may

avoid these risks. This applies alike to apprentices who are learning their trade and to minors, who form a considerable percentage of the new employees.

2. That special effort be made to avoid accident during the first two-hour period of the day, which is considered the most dangerous period of employment.

3. That the employees who appear most susceptible to injury be given particular attention and an effort made to decrease their susceptibility to injury, either by correcting any physical defects which may exist or by instruction and education along the lines of accident prevention.

4. That the use of protective goggles be made compulsory for all employees engaged in work which exposes the eyes to frequent injury from flying particles, that these goggles be fitted to each man individually so that they fit the orbital margin snugly and render the workman immune to injury when he does wear them, and that extra lenses be provided in sufficient quantities so that when a lens becomes disfigured by flying chips which become embedded in the glass and interfere with vision it may be replaced by a new lens.

5. That particular attention be given the shops that show a high percentage of injuries and those that show a high loss of time per man.

6. That exposed shafts, belts, pulleys, flywheels, gears, circular and band saws, and emery wheels be provided with guards wherever practicable.

INTOXICATION BY DETONATION AND EXPLOSION GASES ABOARD SHIP.[1]

Abstracted by K. OHNESORG, Surgeon, United States Navy.

In so far as prevention and appropriate treatment of intoxications resulting from detonations and explosions may be possible, these can be facilitated by a more accurate knowledge of the gases concerned and of the conditions under which they are produced. Since practical experience is lacking, such knowledge must rest for the time being upon experimental investigation. To furnish such experimental data, the author, with Dr. Keller, has carried out a series of investigations in the torpedo laboratory at Kiel.

I.

As explosive materials they selected the powders and explosives used to-day by modern states. These powders consist substantially of more or less highly gelatinized nitrocellulose or of a mixture

[1] By Prof. P. Esch (Marburg). Veröffentlichungen aus dem Gebiete des Marine-Sanitätswesens, Hft. 11, Feb., 1915.

of nitroglycerol and nitrocellulose, to which are added small parts of various substances (such as vaseline, camphor, diphenylamin) the purpose of which is to lower the explosion temperature, to retard the velocity of explosion, or to improve the keeping quality of the powder. For the filling of shells the nitro products of the benzin series are practically alone employed, especially trinitrophenol and trinitrotoluol. The explosive charges of torpedoes and mines, on the contrary, are composed largely of nitrocellulose. The experimental procedure was simple. The materials to be tested were placed in a chamber in various amounts and subjected to detonation or deflagration by means of electrical spark. In order to facilitate explosion, a little black powder was usually added. Sometimes they made use of a red-hot iron wire. In some instances the chamber was partially evacuated before the firing was done. By different experimental arrangements they sought to have the various conditions conform to those of actual practice. The chamber in which they did their explosions had a volume of 20 liters. When electrical sparking was done, this chamber could be so completely closed that no gases escaped to such an extent as to be noticeable by the senses. It was, therefore, also to be assumed that atmospheric air could not enter. For the purpose of chemical analysis, the gases were conducted through a valve to an aspirator. An accurate quantitative estimation of the different gases was not carried out. It was found that the relative volumes of the different gases varied widely, according to the conditions of the experiments; this alone made it clear that accurate quantitative analysis could lead to no practical result. Nevertheless, in connection with qualitative investigation, approximately quantitative estimations were done. In each experiment the chief point was to determine which gas was responsible for the prominent features of the intoxication. Eighteen experiments were done. The constant and important result of all was that poisonous gases are always present in the explosion products. Despite this experimental result, the authors concede theoretically that under the most favorable conditions (complete detonation and adequate oxygen content of the material) only the highest oxidation products of carbon and hydrogen (carbonic acid and water) and inert nitrogen gas will be produced. In all their experiments, however, the complete oxidation stages were accompanied by incomplete oxidation stages; carbon monoxid, hydrogen, and oxids of nitrogen, also methane, and sometimes even acetylene and nitrile (related to cyanid)—the last only in merest traces.

The volumetric relations of these poisonous gases depended upon the conditions of the experiment. The oxygen content of an explosive is of importance in this direction. Another factor in the explosion of grenades, torpedoes, and mines is the so-called charge density

(charge density is the relation of weight of explosive in grams to the volume of the shell or container in cubic centimeters). Is this coefficient low, there will be more carbon monoxid produced; is the coefficient high, little carbon monoxid but more carbonic acid and methane. Another factor is the intensity of the initial sparking. According to the strength of the initial impulse, the decomposition of the explosive will proceed with a wavelike motion at very high velocity, so that, practically speaking, all the molecules of the charge will react at one time. On the other hand, if improperly loaded, or as the result of a poor cap or of a low initial impulse, the wave of propagation of disintegration will lag more or less, and the result will be an incomplete detonation or even nothing more than a mere burning of the explosive. In the first type of explosion, in detonation, the explosive is completely disintegrated. In the second type, deflagration, only a part of the mass of explosive will be exploded almost instantly, as in the case of detonation; the remainder reacts following a wave motion occupying an appreciable time, though less rapid propagation of the flame. In this second type incomplete decomposition of the explosive is always present, and oxid of nitrogen and other gases always accompany the carbon monoxid. Deflagration of explosives can occur through spontaneous combustion, from external flame, or as the result of being struck with a missile. Under certain circumstances detonation may pass into deflagration or vice versa.

Very favorable results were obtained in the complete detonation of the aromatic nitro products; no noteworthy difference between trinitrophenol and trinitrotoluol was observed. In these experiments notable amounts of carbon monoxid were obtained, but no oxids of nitrogen. Theoretically, it can not be denied that oxids of nitrogen could be obtained from such a detonation since a portion of the explosive always escapes the reaction, as is to be seen in the yellow color after a picrate explosion. Nevertheless, it was only possible once, in an incomplete detonation, to secure traces of nitrogen oxids, and apparently in practice they are to be disregarded.

On the other hand, however, they always found with incomplete detonation of these explosives nitrogen monoxid. The quantity of the nitrogen oxid depends on the relation of the burning explosive to the exploding material. In these experiments they also determined that large amounts of carbon monoxid are formed. As a matter of fact, where the explosive chamber contains a large amount of air, the carbon monoxid will be burned to carbon dioxid by the flame of the explosion. Furthermore, methane, acetylene, and nitrile gases were shown to be present, especially in the cases where nitrogen monoxid was found in plenty, indicating an incomplete decomposition of a portion of the explosive. These gases appear in larger

amounts when the explosive undergoes fulmination. Under these circumstances nitrogen oxid appears in appreciable amounts, while carbon monoxid is less prominent.

In the experiments with smokeless powder and with guncotton, a similar result was secured. The addition of an appreciable amount of nitroglycerol to an explosive results in an increase of nitrogen monoxid in the resultant gases, it being indeed well known by experience that nitrous gases can be secured in large amounts by extraction of dynamite cartridges. An important observation was made with smokeless powder. As the result of the presence of a considerable amount of nitroglycerol, this was found in part unchanged in the gases, having been volatilized by the heat. A simple demonstration of this fact can be made by heating a small amount of smokeless powder in a test tube over a flame; the firedamp has a distinctly sweet taste.

Lewin and Poppenberg had previously shown that in the explosion of nitrated aromatic bodies amounts of carbon monoxid up to 30 per cent were sometimes to be found. They also showed that in the fulmination of a half a gram of picric acid 32 c. c. of nitrogen monoxid were produced, from half a gram of trinitrotoluol 25 c. c. of the same gas were secured, while from half a gram of dynamite as much as 68 c. c. of nitrogen monoxid were formed. The full importance of these figures is only realized when one considers the enormous charges of modern shells, torpedoes, and mines. Nevertheless, a destructive gas intoxication can only occur under unfavorable circumstances.

II.

The second portion of the article deals largely with medical considerations. The occurrence of an intoxication depends, of course, upon the amount of the toxic gases. In the direct proximity of the exploding shell, the factor of the explosion itself outweights all considerations of gas intoxication. At a greater distance from the point of explosion, the factor of gas intoxication becomes prominent. The size of the air space is, of course, of moment. In a small room, the gases of explosion will practically drive the atmosphere out of the room. The result of the reduction in oxygen only adds to the toxic action of the poisonous gases, this being especially true of carbon-monoxid poison. The toxic action of the gases is also increased by the high temperature resulting from the explosion. Important also is the possibility of renewal of the atmosphere. An explosion upon deck, even if it be caused by the largest charge, will have much less result than the explosion of a smaller shell within the hull, since both the volume of air and the possibility of change of air are small. Conditions in the boiler room are relatively favorable, because of the

rapid change of air due to the forced ventilation and the suction of air up the draft. On the other hand, the stations in which the gunners are inclosed are exposed to the highest danger and the bunker rooms are also exposed to great danger.

From the gases resulting from a complete detonation follow especially intoxication with carbon monoxid and carbon dioxid. Carbon monoxid, which is odorless, is a typical blood poison, since it forms a firm combination with hemoglobin. The clinical symptoms of carbon-monoxid poisoning are, of course, well known in common life. According to Eulenberg, rabbits die within 4 minutes in an atmosphere containing 5 per cent of carbon monoxid; they live as long as 42 minutes in an atmosphere of 2 per cent of carbon monoxid. Dogs die in 22 minutes in an atmosphere of 1 per cent of carbon monoxid. Haldane inspired for 30 minutes an atmosphere containing 0.38 per cent carbon monoxid; vertigo, palpitation of the heart, difficulty in breathing, and visual disturbances resulted. In this experiment, 39 per cent of his hemoglobin was combined with carbon monoxid; according to the animal investigations, death occurs when a 70 per cent saturation is reached. Under these circumstances, the great importance of higher concentrations of carbon monoxid, such as might easily occur on board ship, becomes apparent.

There is also the possibility that unchanged particles of an explosive that are thrown into the atmosphere might prove toxic. Picric acid dissolved in water is, however, very slowly resorbed from the respiratory and alimentary mucous membranes, and this could not produce an acute intoxication. The same holds true for trinitrotoluol, which is in addition less soluble and less toxic than picric acid. There is nowhere in the literature any report of an early or late case of intoxication in connection with these explosives that can be interpreted as the result of the absorption of the unchanged explosives; signs of renal injury have not been reported. All nitro bodies bind hemoglobin, but this reaction is scarcely to be regarded as of much importance.

With incomplete detonation, carbon-monoxid poisoning is the form of intoxication to be expected. It is, however, in connection with deflagration or the more incomplete forms of detonation that a picture of mixed intoxication occurs. In these gases we have carbon monoxid, carbon dioxid, methane, acetylene, nitrous oxid, and nitriles. The amount of methane may be so large as to be of importance from the standpoint of volumetric replacement of oxygen. In addition the methane may be set on fire, with the result at least of high temperature and increase in carbon dioxid, though on the other hand the carbon monoxid would also be burned. These factors would be of importance only in a small room, but might there lead to suffocation.

Confining ourselves directly to the gases under consideration, a deflagration could result in either a carbon-monoxid or a nitrogen-monoxid intoxication, or a combination of both. Nitrogen monoxid, which is a colorless gas, on contact with the atmosphere, especially at higher temperatures, reacts to form nitrogen dioxid, which has a yellow color; and in the presence of aqueous vapor both nitrous and nitric acids are formed, especially in the respiratory tract itself. These acids, of course, corrode the tissues of the respiratory tract, and this irritation expresses itself in the very first attempts at inhalation of these gases. Any notable degree of such action will be followed by swelling, inflammation, and edema of the respiratory mucosa, extending even into the alveolae. A certain amount of time is, of course, required. As a rule, men who have inhaled nitrous gases in not too high concentration feel little effect for some time. Then dyspnea, thirst, perspiration, abnormal heart action, and anginal symptoms develop. Auscultation of the lungs reveals fine râles. Expectoration, which is at first lemon-yellow, becomes very fluid and tinged with blood, corresponding to the findings in pulmonary edema. Cyanosis later becomes prominent. The blood may show the presence of methemoglobin. Death occurs within the first 48 hours; if it occurs later high fever may be observed. One case has been reported that indicates what is to be expected in the late stages of a mild intoxication. In the case reported by Fränkel a bronchiolitis obliterans developed on the basis of a nitrous-gas poisoning. It is possible that anatomical changes of the type of sclerosis might be expected to follow attacks not severe enough to result in death at the time.

The toxicity of nitrogen monoxid is pronounced. Rabbits and guinea-pigs die within an hour in an atmosphere containing 1 per cent of the gas; 0.1 per cent is tolerated without symptoms. In order to obtain more information, the authors carried out a series of animal experimentations. Nitrogen monoxid was evolved by the addition of sulphuric acid to sodium nitrite; and since the experiment was done in an inclosed space, the amount of gas used could be easily controlled. In an atmosphere of 3 per cent NO, guinea-pigs died in five to nine minutes, there being considerable variation with different animals. Such a concentration of the gas could easily occur following explosion in a ship. In another set of investigations the animals were allowed to remain two minutes in an atmosphere containing 5 per cent of nitrogen monoxid. Then the animals were brought into the fresh air, where they lay upon their sides in extreme dyspnea, unable to walk. The animals recovered rapidly in the fresh air and were soon running about. However, after three-quarters of an hour or so symptoms returned and all animals died within a few hours, death being apparently due to a secondary pulmonary edema. Ne-

cropsy of these animals revealed a cyanosis of the mucous membrane; the lungs were distended and edematous; there were no signs of suffocation; no methemoglobin could be demonstrated in the blood, although the blood of the animals that died in the chamber was always darker than in the animals that died in the open. From these experiments the authors conclude that animals may be killed either as a result of the direct action of the gas or as a secondary result of its action upon the lungs. It is possible also that there is a further factor of nitrite poisoning by which the general dilatation of the blood vessels observed at necropsy is to be explained.

In the gases of explosives containing nitroglycerol, volatile nitroglycerol is found. These fumes of nitroglycerol are taken up by the mucous membranes, possibly even by the skin, and produce the symptoms of nitrite poisoning, methemoglobin being found also in the blood. In view of the extreme susceptibility of many individuals to the action of nitrites, the volatilized nitroglycerol may be of more importance in the explosive gases than has been usually assumed.

Under different conditions of explosion it is apparent that we may have the results of a summation of these intoxications, so that the clinical symptoms and anatomical lesions at necropsy may be very complex.

III.

All attempts at protection against the action of these toxic gases must be based upon a knowledge of their chemical relations. The carrying out of measures of protection depends, however, upon engineering considerations in connection with the construction of ships and, in particular, upon the methods of ventilation. It must also be borne in mind that the very method of ventilation may extend instead of limit the danger, as by the transfer of the toxic gases from one compartment to another. Obviously, the best protection would be achieved by a separate ventilation of each deck and of each compartment. It is obvious that ideal precautions in these directions may be incompatible with the military necessities of the construction and uses of different portions of the ship. It is possible to suggest that certain forms of drills might be taught tending to protect the men from poisonous gases.

The authors discuss two papers by Weber and Riegel. Riegel describes an explosion on the *Marco Polo* in 1914. The crew engaged in their duties remained 20 to 25 minutes in contact with the explosion gases. Eighteen men became sick, three died. Two years later another explosion occurred on the same ship, in the same compartment. Acting upon the experience of the previous episode, the men of the crew were removed from contact with the gases before they

had felt any effect from them. Nine men reported themselves sick; all recovered quickly.

The authors then discuss the question of masks over the mouth and nose. So far as the explosion of shells is concerned, the ordinary kind of mask can only protect against suspended particles, not against the volatile gases. At high temperatures, the men of the crew find the masks very irksome. Such a mask would be really effective only if it could be so charged with a chemical as to remove the noxious gas from the inspired air. Such a device, however, is very difficult of practical application; only a small amount of the protective chemical substance could be used and saturation would soon occur. Furthermore, most chemical reactions would proceed too slowly to catch the gas passing by with the speed of forced respirations. Finally there is, as a matter of fact, no really effective chemical neutralization known. Solutions of soda combine with nitrous oxid only ineffectively; possibly a spray of soda solution might be more effective. For carbon monoxid, cuprous chlorid alone is known to be effective, and to use this in practice would be extremely difficult. To what an extent the modern smoke-proof helmets could be used on shipboard is not known. The eyes must be protected, which could, of course, be done by the use of properly constructed eyeglasses such as are known in the laboratory and on the speedway.

Since in poisoning with nitrous oxid there is a period between the initial intoxication and the later occurrence of pulmonary edema, the possibility of therapeutic measures applied at this time must be recognized. The authors carried out experiments in this direction. They first tested metaphenylendiamin, with negative results. They then tested sodium thiosulphate, and believed that they observed a favorable effect due to its reducing action; they recommend the use in man of hypodermic doses of a tenth or a fifth of a gram or much larger doses by the mouth, thiosulphate being quite harmless. In addition to its reducing action, this substance is also antagonistic to picric acid and nitriles. The inspiration of ammonia relieves the symptoms of the direct action of nitrous gas. The authors believe themselves justified, as the result of animal experimentation, in recommending inhalation of ammonia and the hypodermic injection of ammonia—in such cases only, however, in which it is absolutely known that the patient is suffering from nitrous-acid poisoning. A ready test of the presence of nitrous acid in the mucous secretion of the subject is the blueing of potassium-iodin-starch test paper.

Whenever the subjects of a gas poisoning are unconscious, they should be given artificial respiration with air or oxygen mechanically. They should be protected against peripheral chilling and warm baths are recommended. Heart failure must be combatted with appropriate

measures. After the patient has returned to consciousness, respiratory difficulties will continue and these call for occasional oxygen inhalations. Fluids should be freely administered, above all alkali waters with strong coffee. Transfusion of blood suggests itself as a rational method, as in civil practice. The authors recommend also the intramuscular injection of human blood, drawn directly and not defibrinated. Pulmonary symptoms deserve especial attention. Patients must be kept in bed, the air of their room saturated with moisture, the authors recommending a modification of the old-fashioned croup tent. Pulmonary edema is to be treated with prompt and free venesection.

In a report dated February 9, 1915, entitled "Burns and gas poisoning on board S. M. S. *Seidlitz*," certain cases of late poisoning were described, occurring in sailors who had been exposed to the explosion fumes of smokeless powder. The majority of the men did not present any symptoms for 24 or 36 hours; some of the men were unconscious or semiconscious, but after being resuscitated promptly recovered and resumed their work. Twenty-four or thirty-six hours afterward dyspnea, air hunger, headache, dizziness, nausea, vomiting, and malaise developed. The pulse was slow, blood pressure high, with a slight febrile rise in two cases. The dyspnea disappeared within three days, but weakness and disturbed cardiac action remained for five or six days and the men were not discharged from treatment before the end of ten days or two weeks. The conditions in these cases differ from those described in the publication here abstracted in the complete absence of local or general symptoms during the first hours directly after the explosion. While the symptoms that later developed are strongly suggestive of nitrite action, nevertheless local symptoms referable to nitrous oxid or acids derived from it were not observed at the portal of absorption. Unless one is to assume that other gases of unknown types, or nitroglycerol in volatile state, could be held responsible for the symptoms in these men, one must assume that it is possible to absorb nitrous oxid or its derivative through the respiratory tract in concentration so low as to be devoid of direct irritation while nevertheless high enough to yield amounts of nitrite sufficient to produce spectroscopic evidence of nitrous-oxid-hemoglobin and the clinical evidence of nitrite poisoning many hours later. Such deferred action of nitrite is not explained by the known data obtained through the therapeutic use of nitrite, which is everywhere employed for the promptness of its action upon the circulation.

FLAT FOOT AND ITS MEASUREMENT.

By M. CLEMENTS, Acting Assistant Surgeon, United States Navy.

The height of the inner arch of the foot is measured as the distance between the scaphoid tubercle and the line from the lower border of the internal malleolus to the lower tubercle on the head of the first metatarsal bone (Manual for the Medical Department, Par. 2085 [4]), this line being sometimes called the "Feiss line," which term will be used in this paper for its brevity.

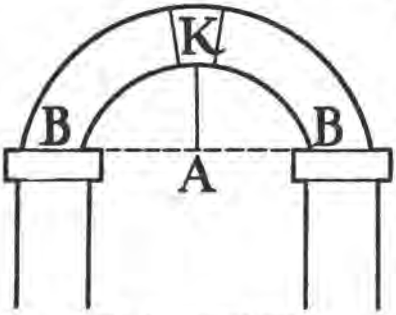


FIG. 1.—Normal arch.

While no "Feiss-line requirements" regarding flat foot are issued in any official instructions by the Bureau of Medicine and Surgery (Memorandum, U. S. Marine Corps Recruiting Bulletin, May 8, 1916), a distance not exceeding ½ inch has been stated as the normal distance of the scaphoid tubercle below the Feiss line (above memorandum and "Weak Foot" by Surg. R. C. Holcomb, U. S. Navy, NAVAL MEDICAL BULLETIN, July, 1913), and this has been the guide for measuring feet in the recruiting service.

As ordinarily measured the height of an arch is the perpendicular distance from the line joining the bases of the arch to the highest

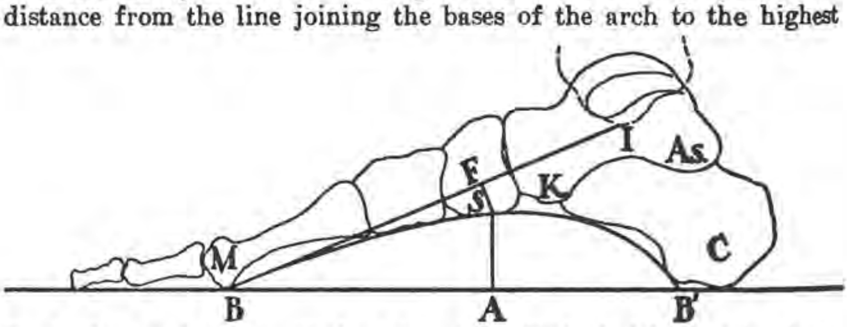


FIG. 2.—Inner arch of foot. (B) lower tubercle on (M) head of first metatarsal; (I) lower border of internal malleolus; (BI) Feiss line; (S) scaphoid tubercle; (F–S) distance from Feiss line to scaphoid tubercle; (C) calcaneus; (B') internal tuberosity of calcaneus; (As) astragalus.

point of the arch, the base line being a "fixed" line, i. e., both ends of the line are equidistant above the horizontal (fig. 1).

In the above method of measuring the foot arch, one base of the arch (anterior end of the Feiss line) and a point in the superstructure of the arch (posterior end of the Feiss line) are taken as the points determining the line below which the height of the arch is measured as the perpendicular distance from this line to the scaphoid tubercle (fig. 2).

The Feiss line is *not* a "fixed" line, for while its anterior end varies in height above the floor within very narrow limits, its posterior end varies within wide limits (from $2\frac{3}{8}$ to $3\frac{1}{2}$ inches above the floor—see table of measurements below). The following measurements of 6 feet, with diagrams, will serve to illustrate this point:

No.	Scaphoid tubercle.		Internal malleolus.	Remarks.
	Below Feiss line.	Above floor.	Above floor.	
	Inches.	*Inches.*	*Inches.*	
1	$\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{7}{8}$	Normal concavity of inner border; normal range of motions; no splay; imprints not flat. (Left foot.) Fig. 3.
2	$\frac{7}{8}$	$1\frac{1}{2}$	$3\frac{3}{8}$	Same as No. 1. (Right foot.) Fig. 3.
3	(R) $\frac{3}{4}$	$1\frac{1}{4}$	$2\frac{3}{8}$	Slight space between feet; motions fair, left better; right imprint flat, left fair; no splay. Fig. 4.
	(L) $\frac{3}{4}$	$1\frac{1}{4}$	$2\frac{3}{8}$	
4	(R) $\frac{3}{4}$	$1\frac{3}{4}$	$3\frac{1}{16}$	Normal space between feet; motions and imprints excellent; arches high. Fig. 5.
	(L) $\frac{3}{4}$	$1\frac{5}{8}$	$3\frac{1}{16}$	

The difference in distance of the scaphoid tubercles below the Feiss line in figure 3 is due entirely to the difference in height above the floor of the internal malleoli, the scaphoid tubercles being the same height above the floor.

In Nos. 3 and 4 the distance of the scaphoid tubercle is three-fourths inch below the Feiss line in all four feet, but its distance

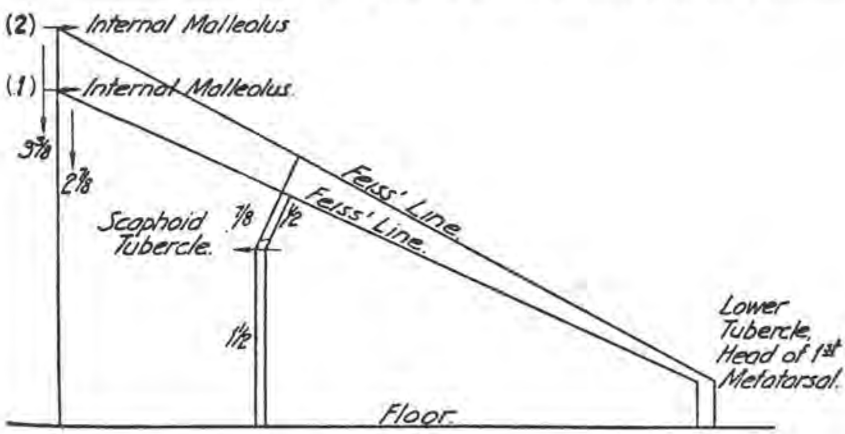


FIGURE 3.

above the floor in No. 3 is $1\frac{1}{4}$ inches, while in No. 4 it is respectively $1\frac{3}{4}$ inches and $1\frac{5}{8}$ inches; No. 3 being a case of low arches, with other signs of flat feet, No. 4 showing high arches, with other points of good feet.

No. 4, compared with No. 1, shows that while the scaphoid tubercles are one-fourth inch lower below the Feiss line, the right is one-fourth inch and the left one-eighth inch higher above the floor.

Now, the inner arch of the foot, except that it is not a symmetrical arch, is similar to any other arch, having its keystone, the astragalus, and its two bases, the calcaneous (internal tuberosity) and the head of the first metatarsal (fig. 2). These bases, for practical purposes,

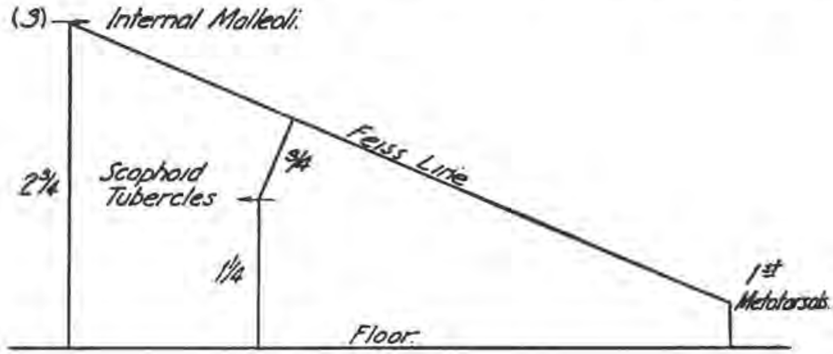


FIGURE 4.

rest upon the floor (the skin, fascia, etc., of course being interposed), and thus the floor line may be considered as the line joining the bases and gives a base line which is a "fixed" line, i. e., its points through the bases are equidistant above the horizontal.

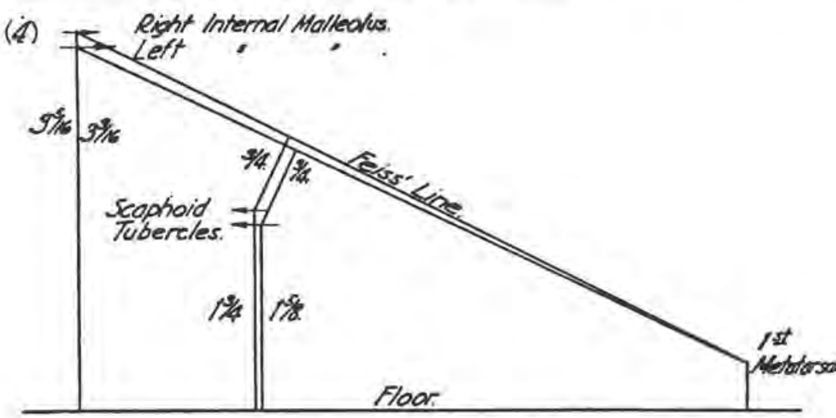


FIGURE 5.

From the above considerations two conclusions are warranted:

(1) The "Feiss line" is a *movable* line and hence it is fallacious to adopt it as a standard for measuring the height of the inner arch of the foot.

(2) The true height of the inner arch of the foot is its height above the floor, or, in other words, is the perpendicular distance from the line joining the bases of the arch to the highest point of the arch, as in fig. 2 the scaphoid tubercle offering a definite point near the keystone from which to measure.

Below is a table of measurements of 100 feet, measured as follows: The two bony landmarks determining the Feiss line and the lowest

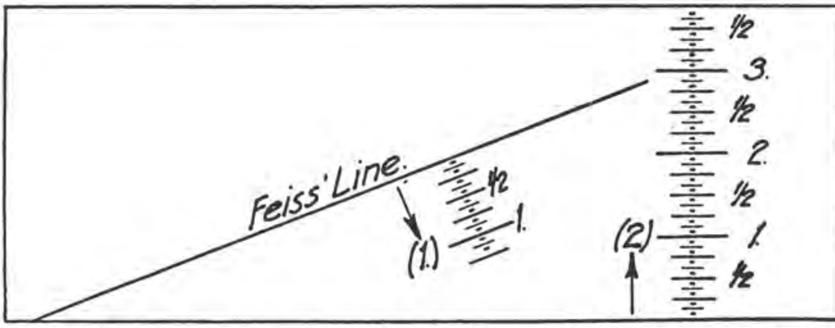


FIG. 6.—Scale (1) for scaphoid tubercle below the Feiss line. Scale (2) for scaphoid tubercle and internal malleolus above floor. While a scale of eighths of an inch is sufficient, sixteenths have been used for more accurate comparison and to leave no choice, of which one-eighth shall be used when the mark lies between.

point of the scaphoid tubercle are palpated and marked with a lead pencil and measured with a celluloid rule, a reduced sketch of which is given (fig. 6.).

NOTE.—Under "Remarks" the term "Feet good" will indicate: 1. Normal concavity of inner borders of the feet. 2. Motions (especially adduction) normal. 3. Imprints not flat. 4. No splay.

No.	Foot.	Scaphoid tubercle below Feiss line.	Scaphoid tubercle above floor.	Internal malleolus above floor.	Remarks.
		Inches.	*Inches.*	*Inches.*	
1	Right...	[illegible]	1¾	3⅓	Feet good.
	Left.....	[illegible]	1½	3	
2	Right...	[illegible]	1¼	3	Right imprint flat, left fair; motions good; no splay. Rejected for flat feet and other cause.
	Left.....	[illegible]	1½	3	
3	Right...	[illegible]	2	3⅜	Feet good: History of sprain left ankle; favors this ankle; rejected for foot and other causes.
	Left.....	[illegible]	2	3¼	
4	Right...	[illegible]	1⅞	3	Arches look low, imprints flat; no splay, motions good. Rejected for feet and other causes.
	Left.....	[illegible]	1½	2[illegible]	
5	Right...	[illegible]	1⅜	2¾	Arches look fairly low; feet good. Rejected—30 pounds underweight.
	Left.....	[illegible]	1½	2⅞	
6	Right...	[illegible]	1$\frac{7}{16}$	2[illegible]	Slight splay, some limitation of adduction; left imprint almost flat; right, fair. Rejected.
	Left.....	1	1	2⅝	
7	Right...	[illegible]	1½	3½	Feet good.
	Left.....	[illegible]	1$\frac{1}{16}$	3	
8	Right...	[illegible]	1¼	2[illegible]	No space between feet, slight splay, imprints flat. Flat feet and 18½ pounds underweight.
	Left.....	[illegible]	1⅜	2¾	
9	Right...	1¼	1⅜	3	Arches look very low, imprints almost flat, motions somewhat limited. Rejected.
	Left.....	1⅛	1½	3	
10	Right...	[illegible]	1$\frac{7}{16}$	3	Feet good. Waiver for ⅛-inch measurement of right foot.
	Left.....	[illegible]	1½	2⅞	
11	Right...	1	1	2[illegible]	Right foot splay, inner border convex, imprint flat, adduction restricted. Rejected.
	Left.....	[illegible]	1½	2[illegible]	
12	Right...	[illegible]	1⅜	2⅞	Feet good. Rejected for 26 pounds underweight and poor physique.
	Left.....	[illegible]	1½	2¾	
13	Right...	[illegible]	1⅜	3	Feet good. Rejected for defective teeth and 15 pounds underweight.
	Left.....	[illegible]	1$\frac{3}{16}$	2⅞	
14	Right...	[illegible]	1⅝	3⅝	Feet excellent, arches high. Former naval service suspected; did not return.
	Left.....	[illegible]	1½	3¼	
15	Right...	[illegible]	1½	3	Left foot flat, right good. Rejected for left flat foot and 26 pounds underweight.
	Left.....	1	1$\frac{1}{16}$	2⅞	
16	Right...	1⅛	1½	3	Convex inner borders, feet flat. Rejected.
	Left.....	1	1⅜	3	
17	Right...	[illegible]	1½	3⅜	Feet excellent. Rejected for marked heart murmur.
	Left.....	[illegible]	1½	3¼	
18	Right...	1	1⅜	3¼	Slight splay, low looking arches. Imprints not flat, motions good. Rejected for 5 corns.
	Left.....	[illegible]	1⅝	3	
19	Right...	[illegible]	1½	3$\frac{1}{16}$	Slight space between feet, but no convexity; feet good otherwise. Waiver for ⅛-inch right foot.
	Left.....	[illegible]	1½	2⅞	

NOTE.—Under "Remarks" the term "Feet good" will indicate: 1. Normal concavity of inner borders of the feet. 2. Motions (especially adduction) normal. 3. Imprints not flat. 4. No splay.

No.	Foot.	Scaphoid tubercle below Feiss line.	Scaphoid tubercle above floor.	Internal malleolus above floor.	Remarks.
		Inches.	*Inches.*	*Inches.*	
20	Right...	1	1 1/2	3	Convex borders, flat imprints, slight splay, motions limited; also congenital hydrocele of cord.
	Left.....	1 1/8	1 1/2	2 7/8	
21	Right...	15/16	1 5/8	3	Very slight space between feet, other points good. Waiver for measurements.
	Left.....	7/8	1 1/2	2 3/4	
22	Right...	15/16	1 1/16	3	Feet flat, left more marked; splay, imprints flat. Rejected.
	Left.....	1 1/16	7/8	2 3/4	
23	Right...	7/8	1 1/4	3 1/4	Slight space between; other points good. Rejected; underweight; undershot jaw.
	Left.....	3/4	1 1/2	3 1/4	
24	Right...	3/4	2	3 3/8	Feet good. Arches high.
	Left.....	9/16	1 13/16	3 1/4	
25	Right...	3/4	1 13/16	3 1/2	Very slight space, other points excellent, arches high.
	Left.....	9/16	1 5/8	2 15/16	
26	Right...	1	1 1/8	3 1/8	Space between, motions fair; left, imprint almost flat; right, fair; splay. Rejected.
	Left.....	7/8	1 3/16	3	
27	Right...	3/4	1 5/8	3	Feet good. Very wide space between feet.
	Left.....	9/16	1 3/8	2 7/8	
28	Right...	1	1 1/16	2 7/8	Very slight space; right, imprint flat; left, poor; arches low. Rejected: feet and underweight.
	Left.....	7/8	1 3/16	2 3/4	
29	Right...	7/8	1 3/16	3	Slight splay, motions good, imprints fair. (Four enlistments.)
	Left.....	3/4	1 1/4	3	
30	Right...	11/16	1 5/16	2 7/8	Feet good; low measurements. Rejected for underweight, large inguinal ring, and measurements.
	Left.....	13/16	1 3/16	2 3/4	
31	Right...	7/8	1 1/4	3	Very small space between feet, motions fair, imprints flat. Rejected, goiter, feet, and underweight.
	Left.....	15/16	1 1/8	2 15/16	
32	Right...	7/8	1	2 1/4	Moderate splay, left more so, left imprint flat, right fair. Rejected, feet, teeth, and underweight.
	Left.....	1	3/4	2 3/4	
33	Right...	9/16	2 3/8	3 1/4	Very high arches, wide space, imprints and motions good. Waiver for 20 pounds underweight.
	Left.....	7/8	2	3 3/16	
34	Right...	7/8	1 1/4	2 7/8	Feet good. Waiver for 8 pounds underweight and measurements below Feiss line.
	Left.....	3/4	1 1/2	2 7/8	
35	Right...	3/4	1 7/16	3	Space between, no splay, motions and imprints fair. Waiver for underweight and measurements.
	Left.....	3/4	1 1/2	2 15/16	
36	Right...	7/8	1 7/8	2 7/8	Feet good.
	Left.....	3/4	1 1/2	3	
37	Right...	3/4	1 1/4	2 7/8	Slight space between, fairly marked splay, imprints fair, motions good, arches low. Rejected.
	Left.....	1	1 1/16	2 7/8	
38	Right...	3/4	1 1/16	2 13/16	Right adduction slightly limited, other points good. Waiver for measurements below Feiss line.
	Left.....	3/4	1 1/2	2 15/16	
39	Right...	3/4	1 3/8	2 7/8	Feet good. Waiver for underweight and measurements below Feiss line.
	Left.....	3/4	1 3/16	3	
40	Right...	7/8	1 1/2	2 15/16	Splay, left more marked, slight space between. Rejected, splay foot, teeth, and large inguinal rings.
	Left.....	1	1	2 7/8	
41	Right...	7/8	1 3/16	3 1/8	Feet good.
	Left.....	1/2	1 1/2	3	
42	Right...	3/4	1 1/4	2 7/8	Slight space between feet, motions fair, left better, right imprint flat, left fair. Rejected, right foot and teeth.
	Left.....	3/4	1 1/4	2 3/4	
43	Right...	7/8	1 7/8	3 5/16	Feet good, arches high. Waiver for underweight.
	Left.....	3/4	1 5/8	3 5/16	
44	Right...	7/8	1 1/2	3	Feet excellent. Rejected for large varicocele.
	Left.....	7/8	1 1/2	3	
45	Right...	7/8	1 1/2	2 7/8	Feet good. (Two enlistments.)
	Left.....	7/8	1 1/8	2 7/8	
46	Right...	1	1 5/16	3 1/4	Arches look rather low but contours, imprints, and motions good. Rejected, heart murmur and underweight.
	Left.....	7/8	1 1/4	3 3/16	
47	Right...	7/8	1 7/8	3 1/4	Feet good.
	Left.....	1/2	1 11/16	3 1/2	
48	Right...	3/4	2	3 1/4	Very high arches, feet excellent. Waiver for underweight.
	Left.....	1/2	2 1/4	3 1/16	
49	Right...	1	1 1/8	2 7/8	No space between, splay, right more marked, inner borders convex, right imprint flat, motions fair. Rejected.
	Left.....	3/4	1 5/16	2 13/16	
50	Right...	5/8	1 1/2	3	Feet good. Waiver for underweight.
	Left.....	7/8	1 1/2	3	

The cases in the diagrams are No. 10, left foot; No. 17, right foot; and Nos. 42 and 43.

SUMMARY OF TABLE.

Scaphoid tubercle below Feiss line:

1/2 inch or less	17
5/8 to 7/8 inch (including 9/16 inch)	60
1 inch or more (including 15/16 inch)	23

Least 9/16 inch, greatest 1 1/8 inch.

Scaphoid tubercle above floor:	
Over $1\frac{7}{8}$ inches	11
$1\frac{1}{4}$ to $1\frac{7}{8}$ inches, inclusive	67
Less than $1\frac{1}{4}$ inches	22
Highest $2\frac{1}{4}$ inches, lowest $\frac{3}{4}$ inch.	
Internal malleolus above floor:	
Over $3\frac{1}{2}$ inches	8
$2\frac{3}{4}$ to $3\frac{1}{2}$ inches, inclusive	84
Less than $2\frac{3}{4}$ inches	8
Highest $3\frac{3}{4}$ inches, lowest $2\frac{5}{8}$ inches.	

Considering only good feet, for the moment, wide variations occur in length, width, size, muscular development, height of the arch, and the size of the bones of the foot, and all combinations of these points occur. A consideration of the three measurements of the foot will serve to give a relative idea of the plan of the foot. Thus in figure 3 the higher internal malleolus and the greater distance of the scaphoid tubercle below the Feiss line indicate that this foot is built on a bigger plan or mold than No. 1, and the same is true in a comparison of the feet in figure 5 and foot No. 1 in figure 3. So the adoption of a single figure as a standard is obviously difficult.

The following observations are made from the above table:

No foot in which the scaphoid tubercle measured $1\frac{1}{2}$ inches or more above the floor had any signs of flat foot.

With one exception (No. 45, left foot), every foot in which this measurement was less than $1\frac{1}{4}$ inches had one or more signs of flat foot.

NOTE.—These two observations hold for 90 additional feet measured since the table was completed.

Thus three fairly definite groups exist:

Good feet, $1\frac{1}{2}$ inches or over.

Poor feet, less than $1\frac{1}{4}$ inches.

A middle group with a range of slightly less than one-quarter of an inch ($1\frac{1}{4}$ to $1\frac{7}{16}$ inches), including both good and poor feet, in which the diagnosis will rest upon a consideration of the several signs of flat foot (the four important ones being noted in the table under Remarks), and the three foot measurements, especially the distance of the scaphoid tubercle above the floor.

A comparison of the two scaphoid-tubercle measurements in the summary of table bears out these three groups, and their upper and lower limits show a close parallel:

The 17 cases measuring $\frac{1}{2}$ inch or less below Feiss line all measured $1\frac{1}{2}$ inches or more above the floor.

The 23 cases measuring 1 inch or more below Feiss line measured from $\frac{3}{4}$ to $1\frac{3}{8}$ inches above the floor, and of these 19 measured less than $1\frac{1}{4}$.

PREVENTION OF MALARIA IN THE FIELD.

By F. X. Koltes, Passed Assistant Surgeon, United States Navy.

In the autumn of last year a sharp outbreak of malaria occurred in a company of marines occupying one of the port towns of Haiti. No medical officer was regularly attached to the post. The only one in the vicinity was aboard a naval vessel that was patrolling the coast, who found occasional opportunity of rendering assistance ashore. When he also was seized with fever I was ordered to the post on temporary duty.

Upon my arrival there were 15 on the sick list, and cases were being added every day. The total number of cases since the epidemic began was 35, one of which resulted fatally of the algid form of pernicious malaria. Most of them were of the remittent type, and examination of the blood of the natives showed the presence of malaria, mostly of the estivo-autumnal form. Examination of the patients' blood was laborious and at times not very satisfactory on account of previous administration of quinin for prophylactic purposes. The city was located on low and flat ground and was evidently a malarial hotbed.

The sick having been looked after, the next step was to attempt to check further infection as quickly as possible. This naturally led to an investigation into the manner with which prescribed sanitary regulations were being carried out, especial attention being given to the use of mosquito nets at night and the daily quinin administration.

As regards the nets, I was prepared, from previous experience, to find some imperfections in the employment of this safeguard, and found in fact that the men were generally remiss in the requirement of adjusting them properly to the field cots. The lower edges would not be tucked in, corners would not be tied down, and many of the nets were torn, and in some cases no use was made of them at all. In fact, no endeavor was made to render them really mosquito proof. This condition was corrected by enforcing strictly the regimental orders relating to it. By means of talks and demonstrations the facts of malarial prophylaxis were explained, emphasis being laid upon the necessity of protection at night. The cooperation of the company was invited. Inspections of sleeping quarters at night were made frequently, and violations of sanitary orders were punished by courts-martial.

The daily quinin routine had become relaxed, chiefly on account of the active duty the men had to perform. This also was corrected, and thereafter each man had to have his name checked off every evening. The doses were given by a hospital corpsman at supper formation. As soon as we were certain that all protective measures were being enforced an antimosquito campaign was begun.

Addition to the sick list began to diminish after the eighth day, and practically ceased after two weeks, and I was able to return to my original station at the end of three weeks, the outbreak having apparently been checked.

Whether this result was entirely due to the remedial measures applied or to some other cause, such as a coincidental self-limitation of the epidemic, one can not be so certain about. Erroneous deductions of this sort are too frequently made. The diminution in the number of new cases after eight days corresponds to the minimum incubation period, and the final morbidity was far below what might be anticipated in malaria when an epidemic has an unhampered sweep through a body of unacclimated men. This is very suggestive in favor of the effectiveness of sanitary precepts carefully observed, and to that extent the incident may serve to illustrate a few points regarding prevention of malaria in the field.

The most favorable opportunity for infection is offered during sleep, because ordinarily the mosquito is not disturbed in its feeding at that time. At other times the sensation of pain from its sting acts as a protection to the host, in that the insect will be driven off, which probably happens frequently before malarial inoculation has taken place. If this assumption is correct it follows that protection of a sleeping individual has an especial importance in prophylactic considerations.

The nets issued with field cots will amply afford such protection if only care is exercised in adjusting them properly. I have found from quite an experience with expeditions that it is difficult to make men do this without constant supervision. The tendency is for them to become careless with the task, which requires close observance of minute details, and means in this instance the closing of every possible entry for mosquitoes. If this is not done the nets are not mosquito proof and are of no more value as such than are leaky buckets for carrying water. This has particular application in case barracks are not screened. The medical officer must therefore know that each man does his duty in this respect, and such personal assurance can only be had by a system of inspections which will not become merely perfunctory and by infliction of punishment for violations.

It is desirable that sleeping garments which cover the arms and legs be provided for men in malarial countries in order to prevent the possibility of stings through the screen. The article best suited for this purpose is the pajama. Such an article may seem too fastidious for the field, but something of that sort is necessary as nothing should be left undone to parry the attack of this vicious little insect with its unerring faculty of finding his prey.

A general agreement of authorities now exists as to the value of the daily administration of small doses of quinin, viz, it directly reduces the chances for infection to a certain extent, and when given to an entire community it inhibits infection of mosquitoes by preventing the appearance of the parasites in the peripheral circulation. The latter factor is, however, a two-edged sword, because it renders difficult a microscopical diagnosis, as any one can testify who has tried searching for plasmodia in cinchonized blood.

The practice is condemned by some on the grounds that it partially nullifies the specific value of quinin in the event of infection by reason of having caused a tolerance for the drug. I am of the opinion that this is more of a fancy than a truth, as such interference has not come under my observation. It has its greatest application in brief campaigns where it is highly necessary to preserve the full strength of a command through a crisis. For many reasons the routine becomes easily relaxed, and to make it effective it is necessary to give it reasonable supervision.

It is not intended to underrate the value of the more far-reaching methods of combatting malaria, such as destruction of mosquitoes and their larvæ and draining of breeding places. But since these measures are not immediately productive of results and not always applicable in short campaigns we are often forced to rely for safety on those agencies of protection before mentioned, which, although narrower in scope, can be rendered with proper supervision really sufficient for the control of the malarial problem in the field.

A WASSERMANN SURVEY ON 500 APPRENTICE SEAMEN.

By C. B. MUNGER, Passed Assistant Surgeon, United States Navy.

This survey was prompted by Bulletin No. 8 of the War Department, Office of the Surgeon General, on "The Prevalence of Syphilis in the Army," by Edward B. Vedder, captain, Medical Corps, United States Army, and contains the results obtained from 500 Wassermann blood tests on accepted recruits stationed at the naval training station, San Francisco, Cal.

The cooperation of the medical officers of the training station was necessary, and considerable effort on their part was required, as the number of recruits admitted during one week was small and the work extended over three months.

An effort was made to have conditions as near as possible those described by the Army bulletin under the paragraph "Prevalence of syphilis among men entering the Army" in order that a fair comparison of results might be made.

The Wassermann technic was used exclusively, with sheep hemolytic system and cholesterin reinforced antigen. The complement was titrated for each guinea-pig and the work was well checked with routine work on hospital cases.

Vedder used the human hemolytic system in his work, but it was not thought necessary to change the system ordinarily used in the hospital, as he and Craig each state "that the selection of a hemolytic system is chiefly a matter of convenience."

The results have been indicated as follows, double plus in cases showing complete inhibition and one plus for 50 per cent inhibition.

The naval training station, San Francisco, Cal., receives men from recruiting offices along the west coast of the United States from Puget Sound to southern California, as far east as Denver, and through the South and West into Texas. The majority come from Texas and California.

These recruits are reexamined by medical officers on the station and those found not to be physically qualified are discharged. No known syphilitics are retained, and this survey was made on accepted recruits with less than one week's service.

The blood was collected on Friday of each week, sent to Mare Island Hospital by messenger, and the work completed the following day. The specimens were all received in good condition.

The results are not what we expected to find but are interesting and may help us a little in prevention.

The results obtained in the Mare Island laboratory are tabulated below together with a similar survey made from recruits at Fort Slocum by the Army.

Place.	Total examined.	+ +		+		+ −		−	
		Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Naval Training Station	500	5	1	3	0.6	0	0	492	98.4
Fort Slocum	500	35	7	48	9.6	54	10.8	363	72.6

The remarkable difference in the results obtained in the two laboratories—that is, 16 per 1,000 for the Navy and 16 per 100 for the Army—is almost unbelievable, but is probably accounted for by the age of the recruit.

The average age of these recruits is 19. The age 17 furnishes the largest number of any year, and 365, or 73 per cent, were under 21. Among those giving the double-plus reaction all were over 21. Two were 21, one was 22, one was 23, and one was 29 years of age. Among the 365 men under 21 only two gave a positive reaction, while from the 135 over 21 six gave at least one plus.

Vedder states that "609.67 per thousand of all the recruits accepted during the fiscal year 1913 were 24 years of age or under and the ages 21 and 22 furnished the largest number." From a study of the tables I should say fully 75 per cent of Army recruits are over 21 years of age, while nearly 75 per cent of Navy recruits are under that age.

Of course it is expected that there will be more cases of syphilis among men of 22 years of age than those of 17, but one hardly looks for the four years between the two ages to account for the great majority of syphilis.

Another factor which may influence the result is leaving home for the first time. A great number of our recruits are brought to the recruiting office by parents or guardian, handed over to the recruiting officer, and transferred to the training station. These boys are under age and have had few opportunities for staying out nights and drinking intoxicating liquors. Men between the ages of 21 and 23 have probably been away from home for a year or two and have already passed through the wonderful experiences to which apprentice seamen take so kindly.

Although it is dangerous to play with figures it is interesting, and a comparison of the official reports of admissions for syphilis, in each service, is given in ratio per thousand of mean strength.

Army:		Navy:	
1912	25.58	1912	23.00
1911	36.37	1911	27.11
1910	22.54	1910	22.54
1909	22.01	1909	25.81
1908	19.99	1908	18.91

These tables show that except for the year 1911, the relative number of admissions in the Navy during the five years is about the same as that of the Army.

From a survey made at the Army laboratory, it is estimated that 16 is the percentage of probable syphilitics in the Army in the United States.

Now if the percentage of admissions is the same, we may assume that the number of syphilitics is the same. Therefore, while the percentage upon admission to the Navy is only 1.6 it soon reaches 16.

If these figures are all true, the majority of cases in the Navy are primary while those in the Army are probably readmissions of the disease contracted prior to enlistment.

It must be remembered that the recruits examined by each laboratory were to all purposes civilians—that is, they had been in the service only one week, or less than the incubation period for syphilis. Also that among those of the average age for entering the Navy we

find 16 per 1,000 are probably syphilitics, while among those of the average age for entering the Army we find ten times that number, or 16 per 100.

Boys entering the Navy soon contract enough syphilis to bring the percentage up to 16 and boys in civilian life do the same thing. In other words one out of six boys will contract syphilis before he is 23 whether he is in the service or out.

A few conclusions drawn from this report are as follows:

The majority of accepted recruits, especially those under 21 years of age, are free from syphilis.

About 15 per cent contract syphilis soon after entering the service.

The percentage of syphilis is about the same, at least not less, among civilians as it is among military men.

The majority of men who contract syphilis become infected some time between the seventeenth and twenty-third years of life and service conditions have little if any influence.

The Navy is much more responsible for the health of the personnel than the Army for two reasons: First, because the men are much younger when enlisted; and, second, because the majority have no syphilis prior to entry into the service.

The prevention of syphilis in the Navy is directly dependent upon some form of prophylaxis and not upon the selection of the recruits, as seems possible for the Army.

Prophylaxis.—We now can see the difficulties to be encountered if we would decrease the amount of syphilis in the Navy.

Apparently different forms of prophylaxis have given good results, but if we stop to think, it has been most efficient among older men who have perhaps experienced some form of venereal disease and have had the necessary mental impression to make them careful. A boy of 17 or 18 takes a sex lecture as a joke and by the time he has learned his lesson it is too late.

Prophylaxis to be efficient must be applied before the boy leaves home and must be in effect during the dangerous stage from the seventeenth to the twenty-third years of his life or until he has reached the age of discretion. Instructions and lectures may teach him to be more careful and may lessen the number of exposures, but his judgment is poor.

In 1914 we had 53,016 sick days charged to syphilis, with a daily average of 145, almost enough to run the entire Navy for one day and quite enough to keep the gunboat *Annapolis* in commission for the entire year. It would appear then that prophylaxis should not be neglected and that the responsibility can not be shirked by calling it misconduct. Bluejackets are not different from other men and as there is bound to be a certain number of exposures, it would seem

to be our duty to those of the next generation to at least give them a healthy body to start with, no matter how radical a measure may be necessary.

MALINGERING IN MENTAL DISEASE.

By R. SHEEHAN, Passed Assistant Surgeon, United States Navy.

A great deal has been written about malingering, most of which concerns the subject in its legal phase where it is involved in litigation attending alleged negligence. We are especially interested in malingering in mental disease or the malingering of mental symptoms.

Malingering in this sense is the effort of an individual to overcome a difficult situation by the production of mental symptoms. This usually occurs in subnormal characters such as psychopaths and defectives. There is getting to be a more generally held opinion that it never occurs in normal persons, that if looked for there will always be found coexisting evidence of actual mental disease. It is extremely doubtful if pure malingering exists at all. Willmans in a series of 277 cases of insanity in prisoners failed to find one of malingering, and Bonhoeffer, in a study of 221 cases of insane criminals, found but 0.5 of 1 per cent that he considered malingerers.

It is not always true that malingering is an acutely conscious reaction, as it is often beyond the awareness of the individual, occurring in the subconscious. It is this which makes it difficult to determine which of the symptoms presented are genuine and which are malingered.

It is quite frequently that we see patients with mental disease who malinger. Individuals who have had some mental symptoms for a number of years, with an irregular history of aggravations and remissions, when placed in a particularly stressful situation assume mental symptoms to present a convincing picture, probably using their own psychic material. They oftentimes show a considerable degree of insight into their mental condition. Because of this abnormal make-up these individuals are apt to cause difficulties if they succeed in getting into the military service. Oftentimes they are physically desirable and are enlisted without question. After enlistment, when compelled to contend with service demands and restrictions, because of their psychotic make-up it is not long before they get into difficulties by coming into conflict with authority or by deserting. If this results in placing them under stress, what appeals to them as the easiest way out is to exhibit mental symptoms. The following case-history well shows the tendency of this type of individual to gravitate into the service as a place of least resistance and his inevitable reaction to his consequent difficulties.

N. C. H. Case 22623 (St. Elizabeth's Hospital). Organization: Private, U. S. Marine Corps. Admitted February 11, 1916. Age, 36 years. Civil condition, single. Nativity, German. Education, grammar school.

Medical certificate states: Father alcoholic; patient alcoholic since 12 years of age; frequently drunk; has always had uncontrollable temper, with a history of numerous difficulties; syphilitic infection February 4, 1914; first mental symptoms became manifest on December 9, 1915, when he shot a corporal who accused him of being drunk on post. There is evidence of mental irritability of long standing. Present symptoms: Hysterical at times; has auditory hallucinations and persecutory delusions; probable cause, alcohol. Homicidal tendencies exist.

Family history: Grandmother was a somnambulist; father alcoholic. Personal history: Born in Chicago June 1, 1881. He was brought up by his paternal grandfather. Early life was uneventful; he claims to have gotten along well at school and states he was sociable. He started to work at the age of 16 years at various occupations, usually leaving his place of employment for some inadequate reason. He enlisted in the Army about 1908 and was sent to Fort Modoc, Cal. In about 16 months after enlistment he had some difficulty with a noncommissioned officer, whom he assaulted, for which offense he was court-martialed. Following this, he had another difficulty, for which he was also court-martialed and sentenced to Alcatraz Prison for one year. While there he lost his allowance for good time. After the expiration of his sentence he returned to Chicago in 1912. He was unable to secure employment there, and went to St. Louis, where he worked in various places for one year, when he enlisted in the United States Marine Corps. Subsequently, while serving on U. S. S. *North Dakota*, he had some difficulty, as a result of which he was court-martialed. Following this he was on duty at the marine barracks, Norfolk, where his present difficulty occurred. He admits the excessive use of alcohol, denies abnormal sexual habits, admits having had gonorrhea several years ago and a venereal lesion in 1904. He received specific treatment.

Present illness: He states his difficulty began while he was on guard duty, when one of the corporals accused him of being drunk. He argued with him, believing that the corporal was after him too much. He lost his temper, dropped his hand to his belt and felt for his gun; he drew back several feet and gave the corporal a chance to protect himself, but the corporal ran toward him, whereupon the patient shot him in the abdomen. He was tried by a general court-martial and was sentenced to seven years' imprisonment, which was reduced to five years. As a result of evidence submitted at the trial, which indicated that he was of a psychopathic make-up

and thought to be in the early stages of a dementia precox, and therefore not responsible, it was recommended that he be sent to this hospital for observation before carrying out his sentence.

Mental status: The patient readily entered the examining room and showed no apprehension or suspicion. He made no complaints, except that his sleep was disturbed; states that this is due to his eyes, which at night sometimes go back into his head. Stream of talk: Free and coherent, but at times rather circumstantial. Emotional status and attitude of mind: Indifferent and rather seclusive; hallucinations and delusions; states he hears voices at night, telling him that he is a faker; these come through the ceiling or roof; he also states that some one has been putting some sort of metal apparatus on his mind. He believes this is done to test his mind. Sleep and dreams: States his sleep is disturbed because of this apparatus; he denies dreams. Insight and judgment: He believes the best thing that could be done for him would be to let him serve out his sentence and then let him go; states the court was not right, because if he was insane he should not have been tried. Habits and character: Has always been seclusive; spent most of his spare time playing musical instruments; has used alcohol to excess, and has always associated with women. Orientation: Correct in all spheres. Memory: Both for remote and recent events is good. Special memory tests were well done. The intelligence tests were adequately done. The forward and backward associations correctly given. The calculations were all well done. He has a good knowledge of current events and a fair fund of general information. The ethical reactions were apparently normal.

Physical examination: Shows numerous scars on the skull and over the trunk, which he states are results of injuries. There is a well-marked scar on the penis. Neurological examination: Negative. Laboratory findings: Urinalysis negative, Wassermann reaction of the blood serum negative.

Summary of notes: Following the patient's admission he conducted himself in an exemplary manner and did not show any conduct disorder; he was quiet and seclusive, but a willing and efficient worker. When questioned about the difficulty which led to his admission to this hospital he defended himself by insisting that the corporal whom he shot had made it difficult for him, and that other men had this same idea about the corporal. During April he continued in a seclusive and indifferent state, rarely conversing with those about him and associating very little with the other patients. On occasions, when interviewed, he was surly and easily became irritable. He declined to discuss his ideas about thought reading, but still admitted that people could read his mind. Emotionally he is easily disturbed; he seemed only approximately oriented to time; he stated that he

was not much interested in anything. Lately his condition has not changed.

In June the patient was presented at conference for an opinion and it was agreed that he is a psychopathic individual who has given a history of trouble throughout his life and who has been arrested a number of times. There is not very definite evidence since being here of hallucinations or delusions, and it was thought that the fact should be taken into consideration that this prisoner no doubt is now aware of the charge of insanity which was brought out in his trial, and he also knows that his sentence would be mitigated if it is determined that he has a mental disease. Because of this, it must be taken into consideration whether or not he is malingering. In view of his past history, which shows that he has had hallucinations and delusions, it is considered probable that he is a psychopathic character, who has shown a reaction of dementia precox of the paranoid form and that he should be retained in this hospital, as if he were returned to prison he would not get along well and would no doubt be returned here.

The whole career of this individual reflects his inadequacy to cope with the ordinary demands of society, with which he comes into conflict on slight provocation. Then, when he is court-martialed for his last offense, he readily grasps the idea that he is crazy, and no doubt magnifies his innate characteristics. Since admission he has not shown any active symptoms. It is only when closely questioned that he becomes surly and disagreeable, and evidences of his psychopathic make-up creep to the foreground. He has readily adjusted to the hospital régime and has not come into conflict with his environment in any way.

In the following case we have a patient who admits malingering mental symptoms, but consideration of his history leaves no doubt that he has merely availed himself of the symptom material he has stored up to attain his result, and that we have to deal with a true psychosis in which he has shown periods of remission and in whom there is a remarkable degree of insight into his condition. This is also instructive as showing the difficulty and expense that may be caused by the enlisting of this type of individual. In the Navy, when the demand for men is not pressing, it would seem that much could be done to exclude this type from the service by requiring them to present references as to their previous career when they apply for enlistment.

C. F. Case 22609. Organization: Private, Second Recruit Company, C. S. I. Admitted February 3, 1916. Age, 30 years. Civil condition, single. Nativity, Norwegian. Education, fifth or sixth grade, grammar school.

Medical certificate: Paternal uncle insane; one brother died of tuberculosis. For the past four years patient has used alcohol to excess at every opportunity. In 1911, while at the recruit depot, he was regarded as peculiar. He did not associate with other men of the company and in eight months never left the depot. He believes he has had tuberculosis. At 19 years of age he was indicted for arson in the second degree, but was adjudged insane and committed to the Matteawan (State) Hospital on January 10, 1903, and was discharged on March 17, 1906. First symptoms: These evidently occurred between 17 and 19 years of age, when he had delusions of persecution and auditory hallucinations. During this time he was confined to his home. Present symptoms: Grandiose delusions. He believes that he is a great inventor and that he is possessed of a wonderful mind. He has visual, auditory, and olfactory hallucinations.

Status on admission: A very well developed adult man; he denied all hallucinations and delusions; claimed he had malingered insanity in order to get a medical discharge from the Army. He was clearly oriented in all spheres. His conversation appeared to be normal, his appearance was unusually neat; he was worried only because he was in this kind of a hospital.

Family history: Negative, except that one paternal uncle was insane and addicted to the excessive use of alcohol.

Personal history: Patient was born in Christiania, Norway, August 18, 1885. He was brought to America as an infant. He began school at the age of 5 and continued until 12, but was a persistent truant, on account of which he was sent to a reform school by the board of education. He remained there six months. Upon release he refused to attend school any longer and went to work. He stayed in one place for seven months and then went to Kansas, where he worked on his brother's farm for two years. From there he went to Texas, but never worked in any one place for over six months. He spent most of his money for drink and was frequently discharged for drunkenness. He then returned to New York, where he worked irregularly at various occupations. At the age of 17 he evidently had a mental breakdown. He had been masturbating excessively. He developed hallucinations of hearing and thought that people jeered at him when he went out on the street, and on account of this he stayed in the house during the day and only went out at night. One night he set fire to the auditorium in Westerly, Staten Island, and the building burned down. The next night he attempted to set fire to the Odd Fellows Hall because he had a grievance against the Odd Fellows, as they had turned him out of their hall one night for disorderly conduct. This was the offense for which he was sent to Matteawan. After his discharge from that

institution he worked as a machinist's apprentice but lost his employment. He enlisted in the Army March 18, 1908.

Military service: First enlistment March 18, 1908; discharged March 18, 1911, as first-class private of Engineers. Reenlisted April 8, 1911, and deserted October 11, 1911; surrendered November 3, 1915. States that during his first enlistment he attempted to reform and bought $135 worth of books on many subjects, including chemistry and physics, with the idea of trying to make something out of himself. He states that during this whole enlistment he did not drink, but during this entire time he was constantly masturbating. He stated his reasons for deserting were that his mind was breaking down again, which he attributed to study and his autoeroticism. Before deserting he burned all his books in the furnace of the barracks. For two years after this he worked very little and used alcohol to excess. He developed a cough and his physical condition became poor, which alarmed him. He went to Bellevue Hospital (New York) for medical advice; there he was informed that his lungs were affected and that he required hospital treatment. About that time he met a recruiting sergeant on the street, who advised him to surrender as a deserter, telling him that he would be sent to Fort Bayard, N. Mex., for treatment.

Present illness: After surrendering as a deserter he was placed on the sick report and sent to the hospital, where he was examined and informed that his lungs were all right. He then regretted having given himself up, and, in order to get out of the situation, he pretended to be insane and claimed to have hallucinations of sight and hearing and grandiose delusions. He stated he saw a man named Miller, who was in his company in a former enlistment and had committed suicide, and that this man visited him at night, because of which he was afraid to sleep in the dark. Said he heard voices talking to him in the room next to his own; said that the dripping of water in the bathroom seemed to be the voices of his mother and sister, and he heard his name mentioned by other men in the dining room at mealtime. At times he smelled lilies in his room, which made him fear he was going to die. At other times he experienced a peculiar and disagreeable taste in his mouth, which he said was caused by his lungs being decayed. He also believed that his brain had become soft and cracked. He stated that he had mastered chemistry and that his atomic theory explained all unusual phenomena. He believed that some one will invent an instrument which when a horse or a cow dies and decays will cause the electrons and molecules to assemble and the meat will be put back on the bones again. He stated that everything was living and moving and that the eraser on the desk was alive because it was made

up of trillions of electrons. He believes he is a great inventor but has been hampered because of his lack of laboratory facilities. He said that he had a mental picture of a country which was isolated from the rest of the world and which had libraries and laboratories free to all. Here each workingman was given a piece of land and required to spend a certain amount of time each day in these laboratories. The vast knowledge thus gained was to be used in protecting the country from invasion and to raise wonderful crops. He believed that if the whole nation is working in harmony and there is an attack by a hostile force he will be able to see the enemy's ships 200 miles, and that by his wonderful knowledge of chemistry and of the atoms and molecules he would be able to produce a terrible storm to engulf the enemy's ships. He said he was the creator of this force and was hailed by the multitudes as the emperor of the world and the cause of the millenium. He says, in order to make a very strong impression on the medical officer in charge of him, he put on a little more every day, so that finally he was adjudged insane and sent here.

Mental status—General attitude on admission: Patient seems to be interested in reading and helping with the ward work. He converses with the other patients and appears to be sociable. He entered the examining room willingly and remained in an attentive attitude; stated he slept well, but at times was kept awake by other patients; he made no complaint. Stream of talk: Free, relevant, and coherent.

Emotional status: He is not depressed or apprehensive; states he is very anxious to get out of the hospital; says he is not happy because he wonders how long he will be kept here. When asked when his troubles began replies "I gave myself up upon the 3d of November, 1913. I had been drinking heavily and got pains in my chest and used to wake up in the mornings with a cold sweat. I had headaches and occasional fever, so I thought I had tuberculosis; that was why I went to Bellevue Hospital, and as a result of which I gave myself up. At Fort Slocum they examined my sputum three times and it was negative. Then when I discovered I was not going to be sent to Fort Bayard I decided to feign insanity; I could do this, as I had been confined in Matteawan. When the medical officer took my history I started in by telling him about the man who had committed suicide and who bothered me by coming to see me every night. Finally I became convinced that I was not putting on strong enough, so I told him I was an expert in electrons, atoms, and molecules, and with the aid of my knowledge of science I hoped to bring on the millenium and invent many different things. Still I thought this was not strong enough and that words alone were not sufficiently convincing and that I must go into a state of excitement to make the impression perfect, so whenever the doctor talked to me I would become excited, look

fearful, and frequently peer behind myself; I could tell by the doctor's expression that I had made good and also by the behavior of the hospital corpsmen. They evidently thought I was insane. I even requested that a light be kept burning in my room at night to keep me from seeing the ghost of this man. The doctor told the corpsman to take me out for a walk around the reservation, but I refused to go. Finally I heard it said that I was to receive a discharge and I did very little acting after that. They started me off and I was under the impression that I was going to the Walter Reed Hospital for observation for a while and then be discharged; I believed this until I arrived at this hospital. When I found out where I really was I made up my mind to make a full confession to the doctors here and be sent back for a court-martial because my mind would be safe in prison, while it might not be in a place like this."

Hallucinations and delusions: None can be elicited; states he has not heard any voices since the year before he left Matteawan.

Dreams: States he has none.

Insight and judgment: States he was brought here because of what he told the Army medical officer, that he did not want to come here, and that had he known that he was to be sent here he would not have gone on sick report, nor would he have told any of his past history. He states that he is not sick and that there is nothing the matter with his mind.

Habits and character: States he does not care for city life; desires to work on a farm. Admits having drunk a great deal periodically and that after taking a few drinks he can not stop; states he has been a wanderer all his life; he denies perverted sexual habits and all venereal disease.

Orientation: Correct in all spheres.

Memory: Good for both recent and remote events, and the special memory tests were answered correctly.

Intelligence tests: All were adequately given. The calculations were poorly done. Forward and backward associations correctly given.

General information: Adequate.

Ethical reactions: Apparently normal.

Physical examination: Entirely negative.

Neurological examination: Shows color blindness.

Laboratory findings: Urinalysis negative; Wassermann reaction of the blood serum negative.

THE REORGANIZATION OF THE HOSPITAL CORPS.

By W. E. Eaton, Passed Assistant Surgeon, United States Navy.

The Surgeon General has recommended that the reorganization of the Hospital Corps, as contemplated by reason of legislation enacted in the naval appropriation act of August 29, 1916, be carried out upon lines similar to the following plan, which will provide the corps with the following grades and ratings:

Chief pharmacist.
Pharmacist.
Chief pharmacist's mate.
Pharmacist's mate, first class.
Pharmacist's mate, second class.
Pharmacist's mate, third class.
Hospital apprentice, first class.
Hospital apprentice, second class.

The important changes resulting from this reorganization are:

(*a*) The strength of the Hospital Corps is established by law and fixed at 3½ per cent of the authorized enlisted strength of the Navy and Marine Corps.

(*b*) Three additional intermediate ratings are provided for, thus placing the Hospital Corps on the same footing with other branches of the service.

(*c*) The statute limitation placed on the number of pharmacists and chief pharmacists has been removed.

It will be of interest to all medical officers and members of the Hospital Corps to know how the reorganization, new designations, and promotions of the Hospital Corps are to be effected, and how enlistments and promotions are to be controlled in the future.

To become effective immediately.—Enlistments will hereafter be made only in the ratings of hospital apprentice, second class, and hospital apprentice, first class. Applicants for enlistment in the rating of hospital apprentice, first class, must obtain permission from the Bureau of Medicine and Surgery to be examined for enlistment.

Age for enlistment as hospital apprentice, second class, from 18 to 25 years; for hospital apprentice, first class, 21 to 28 years.

Upon enlistment in either of these ratings men will be transferred to one of the hospital corps training schools for instruction.

Change of rating to Hospital Corps.—Men in other branches, or the Marine Corps, may change rating only to the ratings of hospital apprentice, second class, or hospital apprentice, first class, provided they are found qualified by examination, and should be then transferred to the nearest training school for hospital corpsmen for instruction.

Hospital apprentices, second class (new rating).—All men who have enlisted as, or have changed their rating to, hospital appren-

tice (old rating), and have held this rating less than six months, will be redesignated as hospital apprentices, second class. Hospital apprentices, second class (new rating), under instruction at a hospital corps training school will be advanced to the rating of hospital apprentice, first class (new rating), upon completion of the course and graduation from the school. Hospital apprentices, second class (new rating), who have not attended a training school and have served for at least six months in the rating, will be advanced to hospital apprentice, first class (new rating), upon passing the required examination. (This group consists of men of previous enlisted service who have been transferred to the Hospital Corps.)

Hospital apprentices, first class (new rating).—Those men who have recently graduated from one of the hospital corps training schools and who have not as yet been advanced beyond the rating of hospital apprentice (old rating) will be advanced to the rating of hospital apprentice, first class (new rating), in accordance with the provisions of the above paragraph.

Pharmacist's mate, third class (new rating).—Those men now serving in the old rating of hospital apprentice, first class (petty officer, third class), who have held this rating for less than one year are to be redesignated as pharmacist's mate, third class. These men are not advanced in rating, but only change their title. No man will be advanced to pharmacist's mate, third class (petty officer, third class), until he has served at least 12 months in the Hospital Corps.

Pharmacist's mate, second class (new rating).—All men now serving in the old rating of hospital apprentice, first class, who have held this rating for at least 12 months will be advanced without further examination to the rating of pharmacist's mate, second class. No advancement will be made beyond this rating (pharmacist's mate, second class) unless the candidate has the required qualifications and passes an examination as required in the following paragraph.

Pharmacist's mate, first class (new rating).—No man will be advanced to pharmacist's mate, first class, unless he meets the following requirements:

(*a*) He must have served in the old rating of hospital apprentice, first class, for at least 24 months.

(*b*) He must have an average mark during the past year of 4 in proficiency and obedience, 5 in sobriety, and a record clear of infractions of discipline.

(*c*) He must be favorably and unreservedly recommended by the medical and commanding officers.

(*d*) He must pass the required examination, attaining a mark of at least 4. This examination should be held by a board of two or more medical officers who, if practicable, should be other than those under whom the candidate is serving. Should the candidate be found qualified, he may be issued an appointment.

Chief pharmacist's mate.—Those men now holding an acting appointment as hospital steward (old rating) will be redesignated as chief pharmacist's mate, acting appointment. Those men now holding permanent appointments as hospital steward (old rating) will be redesignated as chief pharmacist's mate, permanent appointment.

No man will be advanced to the rating of chief pharmacist's mate during first enlistment.

No man will be advanced to any new rating unless recommended favorably by the medical and commanding officers.

To govern future enlistments and promotions.—The following periods must be served in each rating before the candidate is eligible for the next higher rating:

Hospital apprentice, second class	6 months.
Hospital apprentice, first class	6 months.
Pharmacist's mate, third class	12 months.
Pharmacist's mate, second class	12 months.
Pharmacist's mate, first class	18 months.
Chief pharmacist's mate (acting)	12 months.

Hospital apprentices, first and second class.—Men who have enlisted in or have been transferred to the rating of hospital apprentice, second class, and have been detailed to one of the hospital corps training schools for instruction, must serve in this rating until the course of instruction is completed. Upon completion of the course and graduation from one of these schools they will be advanced to the rating of hospital apprentice, first class.

Men who have changed their rating to that of hospital apprentice, second class, and have not attended a hospital corps training school, must serve at least six months in this rating before they are eligible to take the examination for advancement to hospital apprentice, first class.

Men must serve in the rating of hospital apprentice, first class, for at least six months before they are eligible to take the examination for advancement to pharmacist's mate, third class. No man will be promoted to the rating of pharmacist's mate, third class, unless he has served at least 12 months in the Hospital Corps.

On first enlistment men will be enlisted in the ratings of hospital apprentice, second class, and hospital apprentice, first class, only. Men may change their rating to one of these ratings only. Men who have had previous training in nursing, pharmacy, etc., in civil life may be enlisted in the rating of hospital apprentice, first class, provided they obtain permission to do so from the Bureau of Navigation (Bureau of Medicine and Surgery).

All men who are enlisted in or change their rating to either hospital apprentice, second class, or hospital apprentice, first class, during the first half of their four-year term of enlistment will be detailed to one of the hospital corps training schools for instruction.

Pharmacist's mate, third class.—Men must serve in the rating of pharmacist's mate, third class, for at least 12 months before they are eligible for advancement to the next higher rating. Men must have served in the Hospital Corps for at least 24 months continuously before being advanced to the rating of pharmacist's mate, second class.

Pharmacist's mate, second class.—Men must serve in the rating of pharmacist's mate, second class, for at least 12 months before being eligible for advancement to pharmacist's mate, first class.

Pharmacist's mate, first class.—Men must serve in the rating of pharmacist's mate, first class, for at least 18 months before they are eligible for examination for advancement to the rating of chief pharmacist's mate, acting appointment; advancement to the rating of chief pharmacist's mate, acting appointment, however, will depend on the demands of the service for chief petty officers. A pharmacist's mate, first class, will not be advanced to the rating of chief petty officer during his first enlistment, but he may be toward the completion of his first enlistment recommended for the rating of chief pharmacist's mate, acting appointment, with a view to his advancement upon reenlistment should he be found qualified by examination and his services be required in that rating, depending upon the needs of the service for chief pharmacist's mates.

Chief pharmacist's mate.—Men must serve in the rating of chief pharmacist's mate, acting appointment, for at least 12 months before they are eligible for advancement to chief pharmacist's mate, permanent appointment.

The examinations: Candidates for advancement will be examined in the following subjects for—

(*a*) Chief pharmacist's mate (permanent and acting), and pharmacist's mate, first class: Aptitude, general education, anatomy and physiology, minor surgery and first-aid, nursing and materia medica, elementary hygiene and sanitation, diets and messing for the sick, clerical procedures and forms, pharmacy and chemistry, sick-bay and ward duties, and practical work in all subjects. A general average of 4.5 is required for chief pharmacist's mate (permanent), 4 for chief pharmacist's mate (acting), and 4 for pharmacist's mate, first class.

(*b*) Pharmacist's mate, second class: Aptitude, general education, anatomy and physiology, minor surgery and first-aid, nursing and materia medica, elementary hygiene and sanitation, elementary pharmacy, diets and messing for the sick, and clerical procedures and forms.

(*c*) Pharmacist's mate, third class: Aptitude, general education, anatomy and physiology, minor surgery and first-aid, nursing and materia medica, and elementary hygiene and sanitation.

58465—16——6

(*d*) Hospital apprentice, first class: Aptitude, general education, anatomy and physiology, minor surgery and first-aid; also on such general subjects as taught in the hospital corps training school.

(*e*) Hospital apprentice, second class: Aptitude and general education.

Medical officers are expected to use discretion and careful judgment in recommending men for advancement with the view that only the well qualified may be advanced to the various ratings. It is not desired to advance unqualified men because of their length of service only, but to advance those who are fully qualified and who have a satisfactory knowledge of the duties of the various ratings to which they seek advancement.

A supply of the new "Examination Report, Hospital Corps, U. S. Navy," recently revised, should be obtained, and the subjects accorded to each rating be examined for in each case. All advancements in rating should be reported to the Bureau of Navigation (Bureau of Medicine and Surgery), using the prescribed form.

THE RELATION OF SEPTIC MOUTH TO ARTHRITIS.

By F. L. Morey, Acting Assistant Dental Surgeon, United States Navy.

Various theories have in the past been put forward as to the causes of rheumatism, as from some focal infection, overwork, exposure to cold and moisture, strain, or overindulgence in food and liquor; but in the last few years many men have been brought to the realization that a septic mouth is the cause of a large majority of cases of arthritis, both acute and chronic.

I do not want it thought that because my field of work is the oral cavity that I think that all cases of arthritis are due to badly decayed teeth and an unhygienic mouth, but I do believe it is the focus of infection from which a large majority of cases of arthritis, nephritis, cardiovascular diseases, and ulcers of the gastro-intestinal tract begin.

Statements have been made that the mouth was the source from which originated many systemic diseases, but only with the aid of the X-ray, microscope, and cultures could such statements be proven.

Poynton and Paine have given the name of *Streptococcus rheumaticus* to the strain of streptococcus found by them in arthritic joints; this same strain may also be found in abscesses at the roots of the teeth and chronic alveolar abscesses with or without fistulas.

Radiodontia has shown many blind abscesses at the roots of teeth that are seemingly in good condition but whose canals have been incompletely filled; or their nerves have died under a gold crown or large restoration but have never given the patient any trouble and

were nevertheless not properly filled. The products of these blind abscesses have been absorbed by the blood almost as fast as they have been formed.

All of the above-named conditions are more or less relieved by placing the mouth in a hygienic condition. This consists in removing all badly decayed and broken down roots and treating the root canals of those that can be treated if it is possible to reach the apex of each canal. If not possible to reach the apex of each and every canal, the tooth had best be removed, for it will eventually cause trouble and have to be removed. All cases of pyorrhea should be treated, obliterating as far as possible all pockets where food may lodge and set up an irritation.

The tonsils may also need attention. This is, of course, outside the field of the dental surgeon, but each day brings the medical man and the dentist into closer relationship and proves the necessity of hearty cooperation between the two professions.

The mouth, as we all know, is an ideal incubator for practically all micro-organisms, even when in a hygienic condition; and how foul a place it must be when there are deep pyorrheal pockets and abscessed teeth, both blind and fistulous. The blind abscesses throw out their toxins into the blood stream where they invade points of least resistance throughout the system; the fistulous abscesses discharge pus directly into the mouth, where it is mixed with food and infects the gastro-intestinal tract. The products from the pyorrheal pockets are thrown into the blood stream and gastro-intestinal tract. Much trouble comes from ill-fitting crowns and bridges, of which we see an abnormal amount in the service, mainly, I think, because the men are attracted to the advertising office, knowing no particular dentist, and have cheap work done; and I regret to say that not all cheap work is done in the office of the advertiser, but sometimes comes from the office of the so-called ethical practitioner. The patient may not have much time to spare and the work probably may be hurriedly done, or the dentist may think that he will not see him again, and places in the tooth a poor root-canal filling, if he attempts to fill it at all. He places over this a poor filling or a badly fitting crown, which soon produces all the conditions found by Dr. Hunter of London, whose startling declarations and condemnation of present-day dentistry made many wonder if all he said was true, and, if true, how we could remedy the appalling condition.

Dr. Billings, of Chicago, has used the word "overdentistried," which certainly applies to much present-day dentistry. Many badly decayed roots are temporarily saved, either for the sake of appearances or for attaching an abutment of a bridge, and these roots sooner or later cause much trouble, generally unknown to the patient by there being blind abscesses. The service received from these

roots does not compensate for the harm they cause. True, many teeth are saved by thorough root-canal treatment, amputation of the apex of the root, and thorough curetting of the infected area about the apex, but this is an expensive operation, necessitating several roentgenograms and many treatments which the majority of patients can not afford, or at least think they can not; consequently, the service rendered is only commensurate with the fee. In the cases herewith appended it must not be thought that I advocate needless extraction of the teeth, but most of these were bed patients, and therefore unable to come to the office where fillings could be removed and root canals treated. Many cases were of long standing; i. e., crowns and large restorations had been in place for several years, the ends of the roots were denuded, and the area of infection quite large. They needed immediate relief, especially those cases of cardiovascular trouble accompanying the arthritis; and speedy recovery of practically all cases where extractions were resorted to was certainly worth the sacrifice of a few teeth.

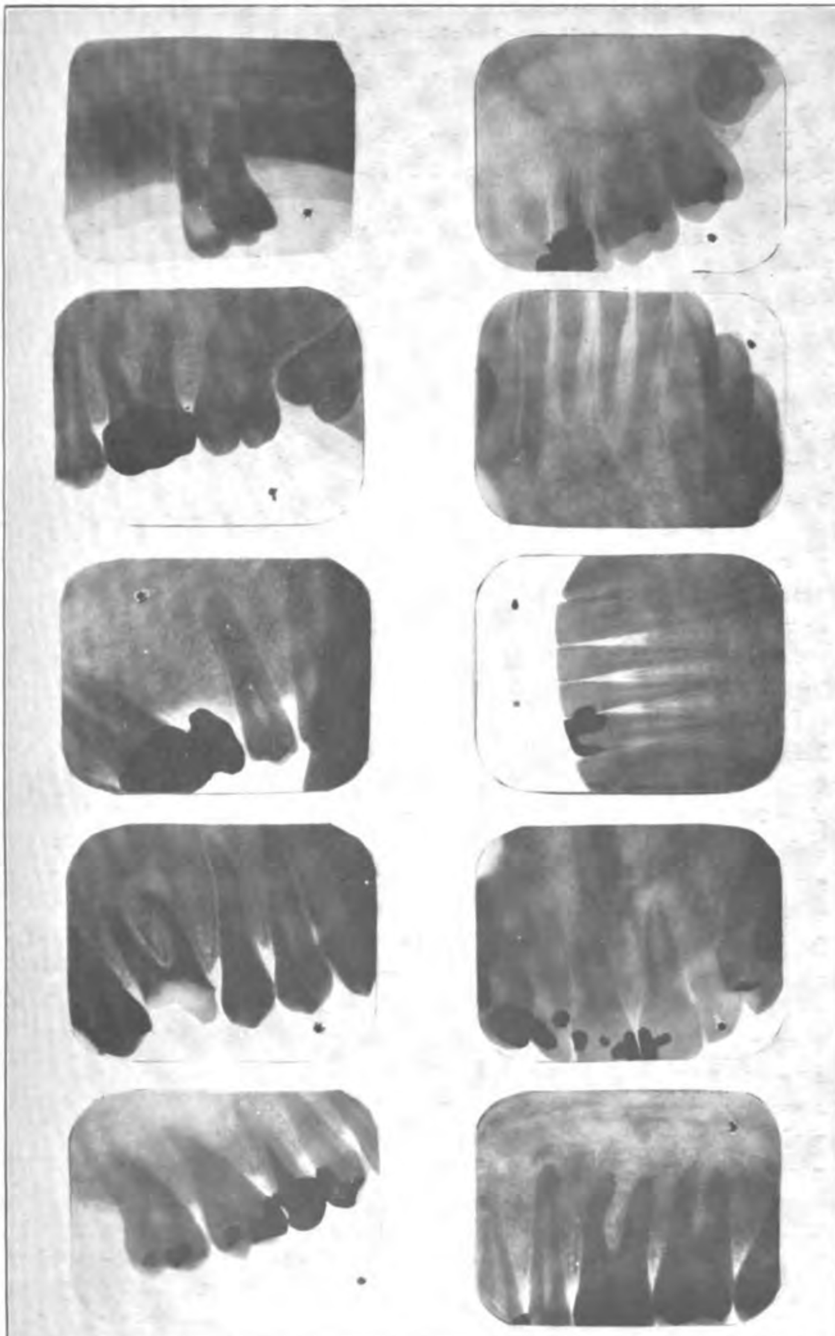
The cures were in some cases miraculous; patients who were bedridden, unable to move their arms and limbs, would within 24 or 48 hours after the removal of the tooth that was the cause of the infection be out of bed and able to walk around the ward. In particular one patient said the pain began to disappear within an hour after the removal of the offending tooth.

The accompanying cuts are of some of the cases herewith appended. They show the blind abscesses and pus pockets around the teeth; it really is not surprising that the patients soon began to feel better and eventually recovered after the removal of the teeth and curettment of the sockets.

The following cases are a few of the many that have been confined to the naval hospital at Mare Island and that have fully recovered after treatment:

Case No. 1.—M. C. Arthritis of the right ankle. Patient unable to bear any weight on his foot for about six months; he had been under treatment most of the time but had not improved very much. A roentgenogram showed a slight area of infection above the right first molar, which had only a small occlusal amalgam filling in it; the patient was advised to have the filling removed and the canals treated, but he preferred to have the tooth extracted. Within two hours after the extraction the pain in the ankle began to subside and the next day he was able to bear his weight on the foot.

Case No. 2.—A. Arthritis of the arms and legs, patient having been in bed for four months, some days feeling slightly improved but gradually growing weaker. No focus of infection could be found; a roentgenogram of the teeth showed a slightly infected area at the root of one of the molars. The first molars had gold crowns

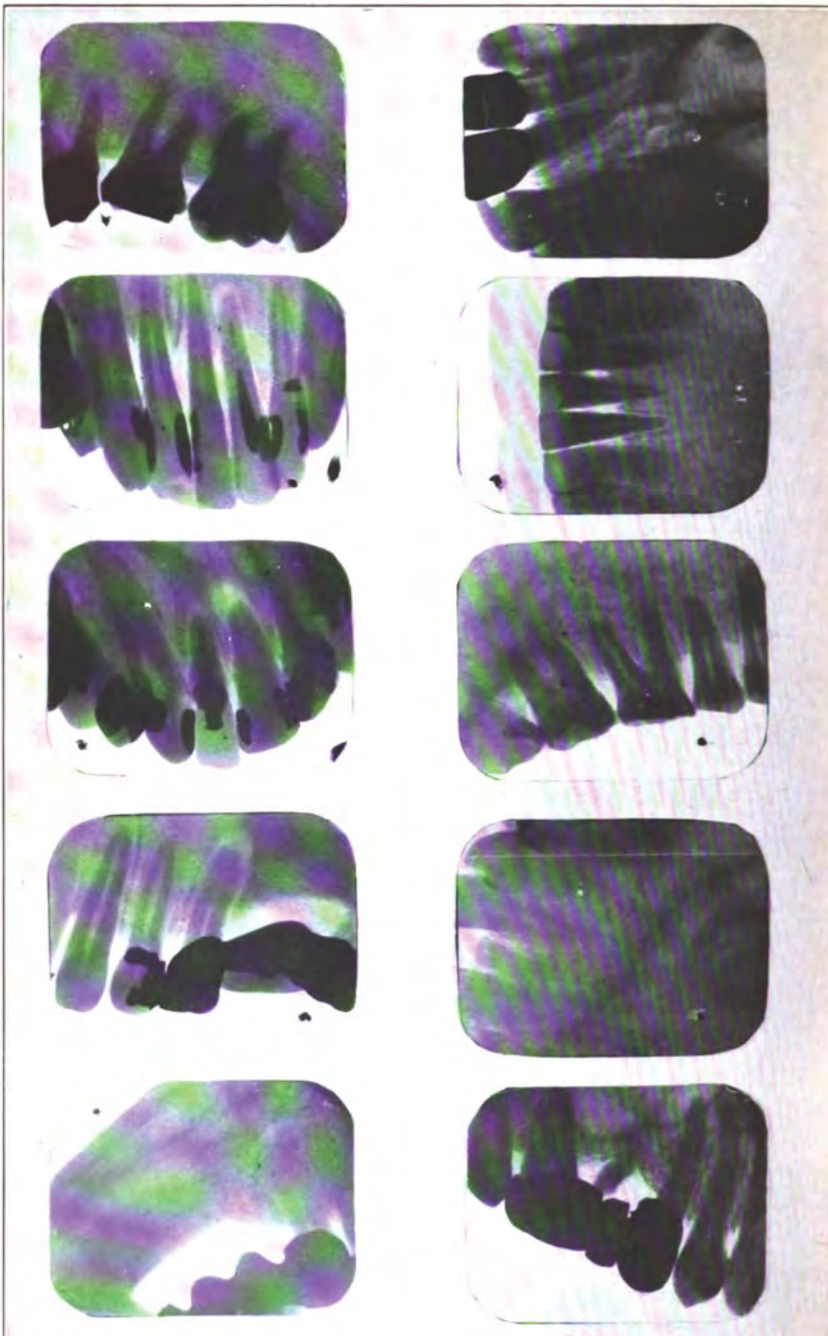


660—1

See description in text.

Case 1.
Case 2.
Case 2.
Case 3.
Case 4.

Case 5.
Case 5.
Case 5.
Case 6.
Case 6.



600—2

Roentgenograms of cases not described in text.

on them and it was thought advisable to remove the teeth that were crowned, as the patient was confined to his bed and it was impossible to open the teeth and treat the roots with any degree of satisfaction. Within five weeks after the extraction the patient was able to walk around, being free from all pain and all swelling having disappeared.

Case No. 3.—G. Confined to his bed with arthritis of the knees and ankles. Removed the left superior first molar, it having a slight infection above it; also removed a badly broken-down root which was the source of some infection. Patient began to improve within 48 hours.

Case No. 4.—C. Arthritis of the right ankle. A roentgenogram of all the teeth showed an infected area above the left superior first bicuspid. The tooth was removed and the end of it was found denuded and rough; also there was a small pus bag attached to it. The patient was able to be out of bed the next day.

Case No. 5.—B. In the hospital five weeks with arthritis of the arms and legs; also had endocarditis, being in such a condition that it was not advisable to extract too many of the infected teeth at one time. Removed the superior right first bicuspid which had a large occlusal filling in it, the root canals having been treated several months previously; also removed superior third molar which was causing much irritation. The next morning he was able to move his arms without any pain. The patient did not improve as he should and we looked for another source of infection; the roentgenogram did not show any further dental trouble, but the gums around the lower centrals were inflamed and it was thought advisable to remove these, which was done and the patient showed further improvement although his heart was not able to regain its former normal condition.

Case No. 6.—W. Arthritis of the extremities. Roentgenogram of the teeth showed that several of the teeth were the cause of the infection. The ones that were the worst were removed and the single-rooted teeth were treated. The arthritis soon disappeared and the patient was able to come to the office for further treatment.

CLIMATIC BUBO.

By C. E. Treibly, Assistant Surgeon, United States Navy.

This is a condition marked by enlargement of the inguinal glands of one or both sides, sometimes associated with pain and moderate fever, the cause of which is unknown.

Distribution.—The condition is common on the east coast of Africa, the Straits Settlements, and China, but is met with in all tropical and subtropical climates. It is also reported to exist in the temperate zone, but during an extended hospital interneship I have

never observed the condition, as those cases which otherwise might be so diagnosed had a too close connection with venerealism. The true climatic bubo is, therefore, in my opinion, although I do not feel that I can so state as an authority, a condition such as is met with only in the Tropics. From my experience in the West Indies I can, however, affirm its frequency in that locality, not so much among the natives themselves as among our sailors and marines who have been so consistently in the Tropics the past few years.

Etiology.—The cause of this troublesome condition up to the present time is absolutely unknown. Many workers in tropical countries have theorized and experimented, but the results are much in conflict. From what I have seen in Cuba and from cases which have been brought to Cuba from Haiti and other islands of the West Indies, I have come to the conclusion of Castellani and Chambers—it is a condition *per se*, with no reasonably assignable etiology.

Pathology.—Each gland seems to have an individual capsule, which is much thickened and very vascular. Some of the glands shell out of their capsules very easily, others are adherent, and in enucleating them there is much venous hemorrhage. Their seeming preference as to occurrence is between and on top of the femoral artery and vein, which vessels have many new capillary connections with the capsule. The gross appearance of the gland upon removal is that of a strawberry. Cross section of one gives the appearance of an incised piece of fat. The center of the gland may contain a minute drop of broken-down material, which does not have the appearance of pus, and in the cases I have seen there is a rarity of this central degeneration. The glands are chiefly solid, of a resisting although compressible feel. There is a great proliferation of lymphocytes. The gland is not trabeculated.

Bacteriology.—There were no organisms demonstrable in about 25 or more cases I have seen. Passed Asst. Surg. E. W. Phillips, United States Navy, retired, in a report of two cases from Panama in 1912, suggests the possibility of protozoa.

Symptomatology.—A typical case presents no subjective symptoms whatever until the appearance of painless swellings in one or both groins. There may be no fever present, and the glands are but very slightly tender, even with rough palpation. The skin is as freely movable over the mass as the great swelling will allow, and no local inflammation is present. The affected glands gradually enlarge to about the size of a hen's egg, or larger in cases which are not operated, and until operation one is led to believe that there is but one single gland in the mass. This belief is quickly dispelled at operation, because after the removal of all that are visible a closer search will bring the total up to six or eight more individual glands,

widely scattered from each other, their capsules having no connection with each other.

I have never found an associated leukocytosis. The blood, in so far as the condition itself was concerned, was negative, except an occasional associated malaria. The urine and stools were also negative.

Diagnosis.—The closest venereal association in any of my cases was over a year before, when the patient admitted gonorrhea, which was apparently cured after about six weeks' treatment, with no complications. No venereal history or evidence of same was obtainable in any of the other cases. In the absence of venerealism, and occurring in the Tropics with the symptoms already enumerated, and with the exclusion of the *B. pestis* culturally or biologically, or the filariae, a diagnosis certainly is not difficult.

Treatment.—There is only one real treatment—excision and enucleation of the glands with removal of the capsule afterward, as the danger of hemorrhage is less. There is no indication for local palliative measures, such as iodin, ice cap, etc.

A number of cases which were merely incised and drained were subsequently operated upon at Guantanamo by Surg. Raymond Spear, United States Navy, and myself. Due to the drainage of what probably was a suppurative condition prior to drainage, the diagnosis of climatic bubo is doubtful.

The method giving the best results is an incision through the skin over the center of the swelling. Then with curved scissors clip enough tissue away from either edge to cause the incision to stand widely open. By blunt dissection each encapsulated gland, when located, is enucleated, the capsule then carefully dissected away with fingers and gauze, and all bleeding points ligated. When you think the glands are all removed, continue the search a little farther. One is very apt to find another one or two elusive glands.

The after-treatment is that treatment preferable for most open wounds in the Tropics, i. e., exposure to the sun an hour or more each day, keeping flies away, and a piece of sterile gauze thrown lightly over the open wound after exposure. This dressing may be improved upon by a wire frame modeled to fit over the wound with the gauze over it.

Constitutional treatment such as iron or cod-liver oil might be used during convalesence. From three to six weeks are required to close the wound. I have seen the best results from this treatment, with no resultant sinuses to deal with, and with absolute cure.

UNITED STATES NAVAL MEDICAL SCHOOL LABORATORIES.

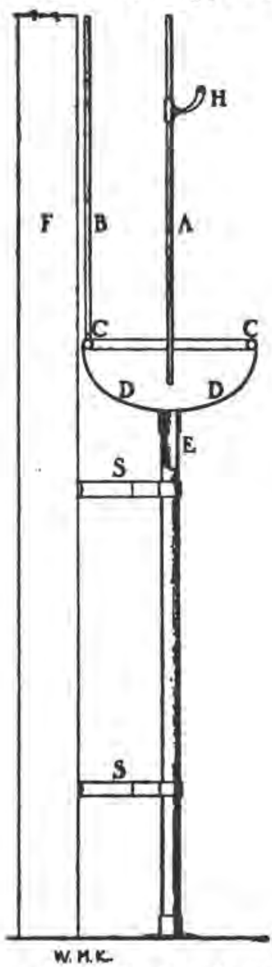
Additions to the pathological collection, United States Naval Medical School, July–September, 1916.

Accession No.	Tissue.	Diagnosis.	Collected by or received from.
1162	Sigmoid flexure	Mesenteric thrombosis	Naval Hospital, Washington, D. C.
1163	Thyroid	Colloid goiter	Do.
1164	Kidney, liver, and spleen	Amyloid change. Syphilitic liver.	Do.
1165	Blood smears	Malaria	Passed Asst. Surg. R. C. Baker.

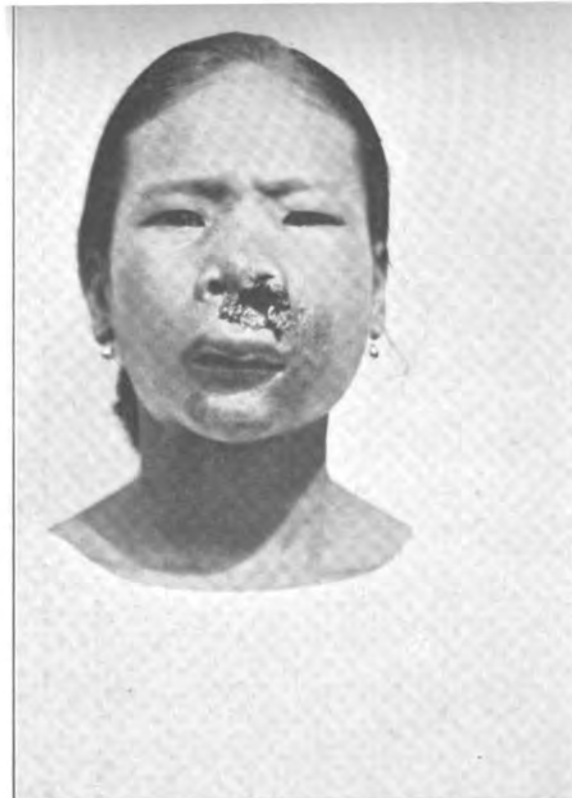
SUGGESTED DEVICES.

A DENTAL FOUNTAIN FOR THE CREW'S USE.

By W. M. Kerr, Passed Assistant Surgeon, United States Navy.

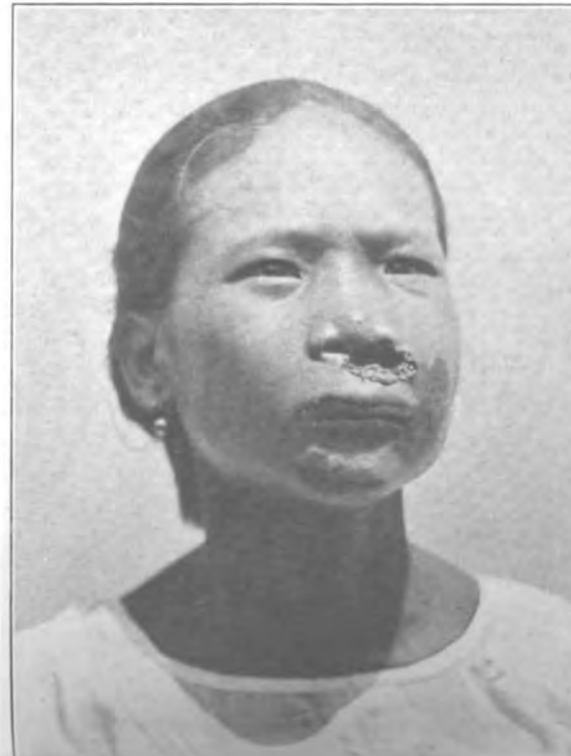


On board ship, although toothbrushes and tooth powders, pastes, and washes are sold in the canteen, a handy supply of fresh water for the cleansing of the teeth and mouth is not always available for the use of the crew. To overcome this disadvantage of life aboard ship a simple dental fountain for the crew's use was designed, manufactured, and installed by the ship's force in the wash room of the U. S. S. *Chattanooga*. It is greatly appreciated by the crew, having been in use for a sufficient length of time to demonstrate its utility. The fountain consists of a copper bowl (D), 12 inches in diameter across the top and 5 inches deep. To the inner edge of this bowl is soldered a three-quarter-inch pipe (C) carrying salt water and perforated in such a way that water continually flows over the inner surface of the bowl into a one-inch drainpipe (E). The supply of salt water is brought to the circular piece of pipe by a half-inch pipe (B) from a salt-water main. The fresh water is obtained through a pipe having a one-eighth-inch outlet (A), provided with a spring valve (H) to prevent waste of water. This pipe extends to within 2 inches of the drainpipe opening, thus allowing sufficient space for the washing of a toothbrush, but not affording space enough for washing the hands, etc. The supports and stanchion are indicated by (S) and (F).



666—1

Figs. 1 and 2.—Gangosa before administration of salvarsan.



666—3

Figs. 5 and 6.—Condition at time of discharge. The scars are due to yaws, not gangosa.

CLINICAL NOTES.

A CASE OF GANGOSA.

By L. W. Johnson, Passed Assistant Surgeon, and C. W. Depping, Assistant Surgeon, United States Navy.

Guam has several hundred persons who show the residual effects of old gangosa lesions, but the treatment by salvarsan and mercury has been so successful that active cases are now very rare and a medical officer may serve his tour of duty here without seeing the disease in its acute manifestations. After a long period without new cases, three have recently been admitted to this hospital, and the most typical is here described since it illustrates the characteristic lesions of the disease and the almost miraculous effect of salvarsan and mercury.

The patient was a Chamorro girl, 14 years old. She had had yaws when 2 years old, the mother yaw on the upper lip. The scars of the yaws can be plainly seen about the mouth in the photographs. One uncle and two cousins had had gangosa, but she had never lived in the same house with any of them. Seven months before admission to the hospital a small sore had appeared on the end of her nose; this spread until there was a large ulcerated area covered with thick crusts and involving the upper lip, cheek, and nose, as shown in the illustrations. The soft tissues surrounding this were greatly swollen and dusky red in color. Most of the cartilaginous septum of the nose was destroyed, but there was no evidence of involvement of the hard palate or mucous membrane of the mouth. There was no pain at any time, but great discomfort due to the foul odor and obstruction of the nostrils by crusts. The Wassermann reaction was strongly positive.

Salvarsan, 0.3 grams, was administered intravenously. There was a strong reaction with headache and dizziness; the ulcerated area was greatly congested, and so much blood oozed from the surface that packing was necessary to stop the flow. Twenty-four hours showed a remarkable change in the condition; the crusts separated; the edema decreased; there was an outflow of serum from the surface, and the foul odor disappeared. The change after 48 hours is shown in the second pair of photographs.

Mercury was given by inunction and iodids by mouth. Rapid improvement continued, and she was discharged 25 days after the administration of salvarsan, in the condition shown by the last photographs.

CHRONIC LYMPHATIC LEUKEMIA WITH ACUTE EXACERBATION AND FATAL TERMINATION.

By C. H. WEAVER, Assistant Surgeon, United States Navy.

Data from health record: M.—Ensign; appointed June 19, 1910; place of birth, Texas; date of birth, January 1, 1891; health prior to appointment, excellent; weight, 134 pounds; vision and hearing, normal; slight basic murmur.

No previous sickness of any importance is entered on the patient's health record up to August 26, 1915, when we have the following:

"U. S. S. *Arkansas*. August 26, 1915. Diagnosis undetermined. Family history negative.

"Previous history: Usual diseases of childhood. Always well up to the summer after first year at the Naval Academy. Had stomach trouble during this summer (1910), with general malaise. The following October had typhoid and recovered nicely in eight weeks.

"Past history: Patient has felt well up to June 19, 1915, when he again became sick with stomach trouble following dietary indiscretion. Has been bothered since that time. Drinks and smokes very little. Tonsillitis a great many times in the last six years. Right tonsil removed in 1912. Left tonsil has been affected since then. Denies all venereal diseases.

"Complaint: Has been having vague pains rather continuously over epigastric region, in midline. Also has had pain over McBurney's point on several occasions, one time lasting 10 days, not painful enough to confine him to bed, accompanied by slight nausea, slight fever, and no headache. Pain in stomach has been present almost constantly following the taking of any quantity of food, especially meats. Has been constipated. August 12, 1915, came to sick bay for pain in ear following swimming over the side. Paracentesis with resulting drainage of bloody serum. Drum healed under treatment. Patient has felt weak and run down, gradually getting worse until now he does not feel like being about. Temperature has been elevated about 1 degree.

"Physical examination: Weight, 130 pounds. Appearance, anemic, sclera pale, mouth and teeth in poor shape. Left tonsil shows deep follicles and slight hypertrophy. Heart and lungs normal. Abdomen rather rigid and at present can elicit no pain except slight tenderness over pylorus and gallbladder. Lower border of liver about two fingers' breadth lower than normal, stomach not enlarged and no ptosis. Spleen slightly enlarged upward. Pulse soft and runs 80 to 90. Skin clear, except that from knees down there are slight hemorrhagic petechiæ which have occurred during the last few days. Subcutaneous lymphatic glands show generalized enlargement. Inguinal, epitrochlear, axillary, posterior and anterior cerv-

ical may be easily palpated and traced, and are not tender. Patient says he has noticed these glands since he was 10 years old, but lately they have become somewhat larger.

"Blood examination: Hemoglobin, 50 per cent. Differential count; polymorphonuclears, 1 per cent (no nucleated reds or myelocytes found); large and small lymphocytes, 98 per cent; mononuclears, 1 per cent; eosinophiles, 0 per cent; leukocyte count, 8,000; red-blood count, 4,000,000. Blood taken for Wassermann.

"Lymphoid leukemia suspected in lieu of hearing from Wassermann test.

"Treatment: Fowler's solution and sodium phosphate.

"August 27, 1915. Transferred to United States Naval Hospital, Norfolk, Va., for observation and treatment."

In addition to this history I afterward gained some rather interesting points concerning the patient's life in the Naval Academy. According to his classmates, he was known to have fallen asleep while on post and very often would drop off into a deep sleep while sitting with a crowd, conversing.

Since entering the academy he has always appeared frail and has had a pale, bleached-out complexion. Notwithstanding this fact, he was never known to complain to any of his friends, and was not on the sick list except for typhoid fever, as noted above.

Up to approximately four days before his transfer from the ship he stood watch in the engine room, did his duty well, and on the day before his transfer was found walking the quarter-deck, contrary to the advice of the medical officer.

On the day of transfer he declined an offer of being sent direct from Hampton Roads by boat to the hospital at Norfolk, but said he preferred taking the trolley car. He was given an attendant and left the ship in good spirits, bidding good-by to his shipmates and saying he expected to be back on board in a week or two.

On admission to the naval hospital at Norfolk we have the following history:

"Naval Hospital, Norfolk. August 27, 1915. Diagnosis undetermined. Origin in line of duty, developed since commissioning as ensign.

"On admission, temperature, 101°; pulse, 98; respiration, 24. A well-nourished man of 24½ years. Slightly pale, with a sparse, fine, petechial eruption on the knees and a few spots on the thighs, and herpes around the mouth. The lymphatic glands of the groins, axillæ, epitrochlear, and cervical regions are greatly enlarged.

"The spleen is palpable, extending 2 inches below the free border of ribs on deep inspiration. There is considerable and constant bleeding from the gums.

"Principal complaint: Epigastric pain and indigestion of nine months' duration.

"Lungs negative. Heart: Systolic murmur at apex and base. Abdomen: Tenderness in epigastrium. Spleen easily palpable.

"Treatment: Light diet. Liquor potassii arsenitis, min. 5 t. i. d.

"August 28. Condition about the same, constant bleeding from the gums. Complains of epigastric pain and a sense of fullness and nausea. Temperature, 97.8° to 100°; pulse, 72; respiration, 20. Blood examination: White blood cells, 32,600. Stained specimen showed only small lymphocytes, no polynuclears in many fields.

"August 29. Condition about the same. Temperature, 99.2° to 101°; pulse, 72 to 88; respiration, 20; mind clear, but is apathetic. Petechial eruption has disappeared. Bleeding from gums continues. Eruption around mouth clearing up.

"August 30. Had rather severe chill about 11.30 a. m. At 12.45 p. m. temperature 104.8°, reaching 105.2° at 3 p. m., and continued at 104° to 105° during the day in spite of repeated cold sponges. Pulse ranges from 90 to 120 and of poor quality. There is great mental and physical depression, but mind is continually clear.

"August 31. Changed diagnosis: Leukemia. Origin in the line of duty, condition developed while in performance of duty on board the U. S. S. *Arkansas*. Temperature continues at 105° plus during the night, in spite of cold sponges and packs. At 6.30 a. m. temperature 104.2°; pulse, 136; respiration, 34. Vomited large quantity of blood at 6.30 a. m., and again at 10.50 a. m. Bloody stool during the night.

"Blood examination: White-blood count, 49,000; small lymphocytes, 99 per cent; large lymphocytes, 1 per cent; polynuclears, 0 per cent; nucleated reds, 0 per cent; poikilocytes, 0 per cent; hemoglobin, 55 per cent; red cells, 3,000,000. Urine negative, save for an occasional red-blood cell. At 8.30 a. m., temperature 105°, pulse, 136; respiration failing rapidly. At 12.15 p. m. has large bloody stool. At 12.45 p. m. is given 1,500 c. c. of saline intravenously, containing 30 c. c. of horse serum. At this time pulse at the wrist is imperceptible, no response to infusion. Is being forcibly stimulated with digitalin and strychnin hypodermically. At 1.45 p. m. vomits large amount of blood. Death occurs at 4 p. m. Temperature 106° 15 minutes before death. Necropsy not made."

This rather brief history pictures vividly the shortness of duration and the rapidity of course taken by this fatal malady which in all probability had been in progress for a period of years. As the patient said he had noticed the glands in his groin ever since he was 12 years old, there is a chance that even then the disease was present.

As to etiology the reader is left to judge for himself. There is a possibility that the chronic tonsillitis might have been either a predisposing or exciting factor. His Wassermann report from the

United States Naval Medical School was negative. Smears of his blood, both stained and unstained, sent to the school were also reported as typical of lymphatic leukemia.

In some respects this case was atypical. He had no palpable lymph glands larger than a small pecan. All of his subcutaneous lymph glands could be palpated. They were not soft, not tender, and did not fluctuate.

The only sign of hemorrhage when he left the U. S. S. *Arkansas* was some minute petecheal spots around the knee and ankle joints. Patient also had an herpetic eruption around his mouth which was thought to be intestinal.

He showed no puffiness about face until just a few hours before death. At no time was there any alteration in the skin except the anemic appearance as noted. The vascular and ocular systems were neither affected.

The only typical picture was the blood, and toward the last the hemorrhages from the vascular system of the alimentary tract.

Besides the other points brought out, I wish to impress the fact that up to August 25, 1915, this man was standing a regular four-hour watch in the engine room; that on August 27, 1915, he felt equal to a 15-mile trolley ride, and in four days was dead of hemorrhage, notwithstanding the fact that he received, during his short stay in the hospital, the best of treatment under most competent men.

CASE REPORTS FROM U. S. NAVAL HOSPITAL, PORTSMOUTH, N. H.

By F. M. Bogan, Surgeon, United States Navy.

Case No. 1.—The patient, a deserter, while working in a lumber camp in New Hampshire, attempted suicide by shooting himself in the left chest. The muzzle of the gun touched his coat and the large charge of buckshot entered his chest, carrying with it a wad of clothing.

From the lumber camp he was taken to a civil hospital, where he remained for one month. The Navy Department then directed that he be transferred to this hospital, and one bitter cold day he was brought in a sleigh, a distance of about 20 miles. When examined, he showed extensive burns over the chest and a large cavity near the left nipple, with the fractured extremities of the sixth rib protruding. There was a copious discharge of thick, green pus from the wound. From head to toes he was covered with the lesions of scabies—this after a month's treatment in a civil hospital. Each morning his bed linen was soiled with blood and scabs. Active treatment with tincture of iodin quickly cured the scabies, while an incision at the sixth rib and posterior axillary line allowed 76 shot to drop out. Frag-

ments of rib were also removed. The cough and expectoration gradually improved, and at the time of his transfer for trial he was practically well.

He was unruly, discontented, and stated repeatedly that he proposed to do a better job next time. He refused to discuss the reasons for wishing to die, but when asked to promise not to make any attempt on his life while in the hospital readily did so, and kept his promise. As previously stated, he was under treatment in a civil hospital for a month. When the hospital authorities presented their bill it was found that there was no fund available from which to defray hospital expenses while in desertion. The patient had money on the books, and it was suggested that he sign for an amount sufficient to pay the hospital bill. This he refused to do, at the same time saying that he was treated finely and would see that they were paid.

One practical point of real value in this case was the cure of scabies with tincture of iodin after all other methods of treatment had failed.

Case No. 2.—This patient was first operated on for appendiceal abscess. A McBurney incision was made and a simple drainage operation performed. At this time the tip of the appendix was all that could be exposed. The base and cecum were so firmly bound down by adhesions, and the patient's condition was so precarious that no attempt was made to remove the appendix.

There was an uneventful recovery, but after a month a ventral hernia developed. At the time of the second operation, which was performed for the repair of the hernia and removal of the appendix, it was noted that the cecum was freely movable, the base of the appendix presented when the peritoneum was opened, the whole appendix was free, and there was no evidence of former adhesions.

From this case it appears that dense adhesions can be obliterated during a space of three months and that the cecum and appendix at first bound down by such adhesions may in this short time become freely movable.

Case No. 3.—While working over the ship's side in dry dock the patient fell from a stage to the bottom of the dock, landing on his left knee.

At operation a comminuted fracture of the patella was noted. The largest portion of the lower half of the patella was inverted and driven into the insertion of the patellar ligament. After fragments had been removed only about half the bone remained, and there was so much traumatism to the patella and its ligament that the prognosis was bad. The cavity of the joint was occupied by a firm clot which was not disturbed. Holes were drilled in the two large fragments

and they were approximated by kangaroo tendon. The leg was put up in plaster.

The patient made an uneventful recovery, despite the great amount of traumatism, and was discharged from the hospital with excellent motion in the knee joint.

Cases No. 4 and 5.—Two patients with small ventral hernias presented almost exactly the same pathological condition. There was a small slit in the linea alba, about 2 inches above the umbilicus, through which a cushion of omentum had protruded. Leading back into the abdominal cavity from this slit was a distinct canal about 2 inches long. One patient gave a history of being struck by a rock, the other claimed that he noticed the swelling after lifting heavy lumber. The writer believes that in both cases the condition was a congenital defect.

The omental hernia was ligated and removed, and the usual Mayo overlapping operation performed.

Both patients returned to duty cured.

ACUTE INTESTINAL OBSTRUCTION DUE TO VOLVULUS.

By C. I. Wood, Assistant Surgeon, United States Navy.

On March 9, 1916, one of the musicians aboard the U. S. S. *Maryland* reported at sick bay early in the morning suffering with severe cramps of the abdomen accompanied by vomiting. The patient, a musician, second class, stated that he had had no bowel movement for the past 48 hours, and that he had been subject to attacks of constipation accompanied by vomiting. The day previous to present attack he had played a wind instrument for two hours at a band concert. No history of indiscretion in diet was obtainable.

On palpation the upper abdomen was distended and very tender in the midepigastric region. An enema was given with poor results. Vomiting persisted at frequent intervals during the morning. A large amount of coffee-ground vomitus was ejected, and following this the patient's pulse became weak and thready with a rate of 140 per minute and signs of a mild degree of shock. An ice bag was applied to the abdomen and morphin administered by hypodermic injection to prevent further peristalsis. Hot saline was administered per rectum by Murphy drop method. Following the injection of morphin the vomiting became less frequent, the vomitus now being bile stained. The patient rested quietly for a time, but the pulse continued rapid, weak, and thready, and the face had a marked pallor. This condition persisted during the afternoon. The abdomen remained distended, moderate rigidity of recti muscles, and much pain in epigastric region.

Due to superior operative facilities and treatment in hospital ashore, he was removed that afternoon to the St. Joseph Hospital, San Diego, Cal. Early the next morning fecal vomiting occurred, no passage of flatus or fecal matter per rectum had taken place, and the pain, tenderness, and distention of the abdomen persisted.

It was considered advisable to operate at once. A Kocher incision 6 inches in length to the right of the median line above the umbilicus was made, and exploratory of abdomen performed. The appendiceal and gallbladder regions were normal. The ascending, transverse, and descending colon was normal in color and size. A large loop of the sigmoid flexure extended across the abdomen almost to the hepatic region. It was, however, normal in color and size. The pathology lay in a portion of the small intestine where a volvulus was present. About 1½ feet of the small intestines was dilated, very dark and congested, and showed a few black areas where necrosis would soon have occurred. Upon examination of the mesentery of this portion of the intestine, it was found to be twisted in a tight coil in clock-wise direction. After a few moments of gentle manipulation by twisting the loops of intestine *en masse* from left to right the normal relationship of the intestine and mesentery was restored. The affected portion of the intestinal tract was then subjected to packs of hot normal saline for several minutes. The appearance of the gut soon changed from a dusky red lusterless appearance to one of more life, and slight peristalsis was observed. No serous exudate or adhesions were present. Examination failed to reveal any retroperitoneal hernia, anomalous folds, or peritoneal bands. The recovery was uneventful. No vomiting occurred after the patient reacted from the anesthetic and good bowel movements were obtained during convalescence.

This case helps to emphasize the value of early diagnosis in intestinal obstruction, and the advisability of operation at once as soon as the diagnosis is established. It would be a perfectly safe statement to make that in the case cited above there would have been a gangrenous area in the involved portion of the intestinal tract and the necessity of excision of a portion of the gut if delay in operation had been permitted for from 12 to 24 hours longer; all of which would have been very serious and a risk to the life of the patient.

SPLENITIS: REPORT OF A CASE.

By T. Wilson, Assistant Surgeon, United States Navy.

A mess attendant, first class, United States Navy (Chinese), age 40 years, was admitted to hospital from U. S. S. *Cincinnati* on August 6, 1915, with the diagnosis of "schistosomiasis, intestinal."

After the patient was admitted to United States Naval Hospital, Canacao, P. I., nothing could be found in his stool and repeated examinations showed nothing that would in any way lead to a final diagnosis. White-cell counts usually ranged between twelve and fifteen thousand. Urine showed a few scattered hyaline casts. No pus, no albumin. Patient had a slight, dry cough with negative sputum for tuberculosis and no definite chest symptoms. Pulse ranged usually from 100 to 120 per minute. Tension slightly raised. No murmurs, heart dullness extending 1 inch to the right of sternum. Frequently patient complained of pain in precordia. Liver at costal margin, no enlargement upward.

On admission the spleen could be distinctly palpated a good handbreadth below the costal margin. Patient had lost considerable weight and his hemoglobin estimation stood at 70 on admission. Two weeks after admission the spleen had shown perceptible increase in size. August 25 showed the spleen still increasing in size with a marked dome-shaped enlargement about the center to the left of the umbilicus. Diagnosis was changed to "splenitis, chronic interstitial." Exploratory laparotomy was performed under ether. Due to the weakened and feeble condition of the patient at that time, a splenectomy or further operative procedure was abandoned. Due to the tense abdomen containing the large spleen, one or two of the sutures taken in closing the wound sloughed five days after the operation. From this time until the death of the patient on September 30, 1915, the wound had to be dressed twice each day, a seropurulent discharge making this necessary. Wassermann (Emery method) proved weakly positive three days after operation. Mercury salicylate given. Salvarsan, 0.3 gram, was administered. Potassium iodid was given in large doses. Two Wassermann tests one week apart later proved negative. The patient did not improve, spleen gradually enlarging until it reached 2 inches below the crests of ilium in left iliac fossa.

Necropsy: September 31, 1915. Abscess of spleen remarkable for size of cavity and the amount of thin pus contained. Cavity of abscess located under the dome-shaped portion of spleen previously described. Malignant growth of pancreas which had infiltrated all the surrounding viscera with the result that many adhesions had formed between the pancreas, spleen, and intestines. Mesenteric glands markedly numerous and infiltrated. The most remarkable pathologic finding was a pyemic condition of the heart muscle. Multiple small abscesses invaded all parts of the muscular tissue. There existed a fibrinous adhesive pericarditis, with a large amount of fluid in the sack. The heart itself seemed decreased in size and red in appearance when the adhesions were stripped from its surface. The general appearance of the organ, with its many adhesions and fibrinous strands resembled a very large mango seed. One or two

old clots were found clinging to the aortic ring. Adhesive pleurisy and numerous tuberculous foci were found in lower lobe of left lung, and multiple abscesses and parenchymatous degeneration of both kidneys.

SOME UNUSUAL CASES OF SYPHILIS.

By M. B. HIDEN, Assistant Surgeon, United States Navy.

Case No. 1.—A, ordinary seaman, age 23 years, was at Chungking, China, from August to October, 1914. On January 2, 1915, he reported to the sick bay with a peculiar skin eruption. His past history was absolutely negative. He had been bothered with this skin trouble for some time before he reported it. The disease had probably been contracted at Chungking. The following description is quoted from his health record: "Patient has an eruption on arms and lower limbs, which comes out as circumscribed, red, slightly raised roseola spots. Itching and burning is present. The process goes on until there is exfoliation of the epidermis, followed by healing, leaving a brownish pigmented scar." The diagnosis made was pityriasis rosea. During treatment with a phenol and salicylic-acid ointment the eruption disappeared, but returned from time to time.

The following, under date of March 26, 1915, is noted on his health record: "Fissure of anus, in line of duty, not due to his own misconduct, due to infectious influences. Patient has constipation, external and internal hemorrhoids, a fissure about an inch and a half long which runs up into the bowel, and pityriasis rosea over a large part of the body and extremities and especially on the buttocks. Survey requested. Treatment: Vegetable cathartic pills and mag. sulph.; opium salve to anus. Prescription: Ointment (see above) to pityriasis. March 29, 1915, survey met, results as follows: Diagnosis: Fissure of anus, in line of duty, not due to his own misconduct, due to infectious influences. Present condition: Unfit for duty. Probable future duration: Indefinite. Recommendation: That he be transferred to a civilian hospital for operation and treatment. April 7, 1915, transferred to a civilian hospital (Victoria Nursing Home). Treatment: Cold sponges and aristol to anus at night. Cathartics when necessary."

After being in the hospital awhile it was learned that he had developed a very chronic small ulcer on the front of the left tibial region. Examination revealed a general adenitis. Patient denied venereal disease, and especially chancre. Syphilis was suspected, and patient was put on protiodid of mercury by mouth. Later he received salicylate of mercury by hypodermic. He began to get better immediately. Within one month all signs and symptoms of the fissure,

of the pityriasis, and of the ulcer were gone. His general condition improved wonderfully, and he felt better than he had for many months. After these therapeutic results syphilis was put on his record and syphilitic treatment continued. It has now been over seven months since his discharge from the hospital. He has had no return whatsoever of any of the above symptoms, and his general condition has been excellent. Due to the rarity of syphilitic anal fissures and the very atypical character of the skin lesion, it was impossible to make an earlier diagnosis of syphilis.

The three cases given below were seen and treated at the French Catholic Hospital, Chungking.

Case No. 2.—A girl, 15 years old, from the very poorest class of Chinese, was admitted and the writer notified that a case of "exposed heart" was in the ward. Past history was very unreliable and extremely hard to obtain. Patient had been sick for about a year, but details could not be gotten. There was a round opening an inch and a quarter in diameter through the skin, subcutaneous tissues, muscles, sternum, and mediastinal structures down to and exposing the pericardium for about an inch. The cardiac pulsations were very striking. There were large scars on both tibial regions and small pigmented scars on her back. One tonsil was missing and there was a very marked general adenitis. The diagnosis was gumma of the sternum and the treatment was large hypodermic doses of salicylate of mercury. Just as marked signs of improvement began, the patient became impatient and left the hospital. She was not seen again and the final outcome is unknown.

Case No. 3.—Low-class Chinese boy, 17 years old, entered the hospital with a very acute, extremely painful process which had destroyed the middle third of his nose. The root of the nose, the tip, and the alae nasi were not involved. The upper lateral cartilages on each side, the lower fourth of both nasal bones, and the inferior third of the nasal processes of the two maxillae, with the corresponding part of the skin, subcutaneous structures, and nasal septum had been removed by the disease. He had been to a Chinese doctor who advised an operation, but would not operate without money in advance, of which the sick man had none. Past history was not obtainable. Patient had very pronounced general adenitis and scars from old ulcers on various parts of his body, especially just in front of the left ear. He was entered with syphilis. The nose was dressed twice daily for two days with silver nitrate solution, 2 per cent, and then with equal parts of balsam of Peru and castor oil. Hypodermic injections of salicylate of mercury in large doses were given. The patient made a very rapid, uneventful, happy recovery, leaving the hospital in five weeks with healing complete and with much less deformity than expected.

Case No. 4.—Chinaman, 35 years old, a water carrier, applied to the outdoor clinic for treatment. No past history could be gotten. He presented an ulcer covering practically the entire anterior aspect of the left leg, extending from just below the patella nearly to the ankle. It was 9 inches long by 5½ inches broad. The tibia was exposed for 2¼ inches. The tibialis anticus muscle had been divided by the process, and about 2 inches of the upper end of the lower fragment (mostly tendon) was hanging over the lower margin of the ulcer onto the dorsum of the foot. There had apparently been no dressing or treatment. Examination disclosed marked enlargement of the superficial lymphatic glands, pigmentation from an old eruption, and scars from healed ulcers. His trouble was clearly the result of syphilis. It was remarkable how he, in this condition, could carry two large buckets of water up a steep hill for eight or ten hours a day. He refused admission to the hospital on the plea that he had no money. The maximum charge, including everything, to this class of patients is $3 Mexican currency (or about $1.20 United States currency) per month. The hospital insisted on taking him free, but he could not accept, for his family of seven could not exist without his salary. His pay was less than $5 Mexican currency, or $2 United States currency, per month. The protruding fragment of muscle and tendon was cut away. The ulcer was cleaned and dressed. He was given a hypodermic injection of a large dose of salicylate of mercury and advised to come back for treatment regularly. He was never seen afterward and the end results can only be guessed.

The three following cases were seen and examined on the streets of Chungking. Their condition had probably been to a certain extent self-inflicted, or at least encouraged, for business reasons. Any suggestion of or attempt at treatment or a cure would have been strongly resented. They were the most successful of all the many Chungking beggars, the last one noted exceeding the other two by a good per cent.

Case No. 5.—Chinese boy, 12 years old, from whom no past history could be gotten. Eight of his toes showed marked dactylitis, some deep, some superficial, some showing extensive scar formation with marked deformity, and others still ulcerating. He had four ulcers on the front of one leg and five on the other. General adenitis and pigmented scars on his body confirmed the diagnosis of syphilis.

Case No. 6.—Chinese boy, 14 years old, from whom past history and other information was not obtainable. Nine toes and six fingers were inflicted with dactylitis, some deep, some superficial. Among these were seen ulcerations, scar formations, great deformity, and three showing bad paronychia and onychia. Scars on body and legs showed the sites of old ulcers. General and great enlargement of all

the subcutaneous lymphatic glands was present. The obvious cause was the *Treponema pallidum.*

Case No. 7.—Chinaman, age about 30 years, from whom no information could be gotten, presented a face with no nose, no eyes, and a large part of both lips gone. His face was made up almost entirely of scars and ulcers. His body and legs were extensively marked by luetic scars, and his lymphatic glands were characteristically enlarged. He was the beggar of Chungking proper, but outside the city, on one of the most important roads, he had a rival who was even more of a business success. The latter, in addition to having much the same face as the former, possessed lesions of the scalp and ears.

GUNSHOT WOUND OF THE KIDNEY: REPORT OF A CASE.

By C. W. DEPPING, Assistant Surgeon, United States Navy.

Primary gunshot wounds of the kidney are extremely rare, and in almost every case several of the other abdominal organs are involved as well. The stomach, small intestines, spleen, and colon are the viscera most often injured. The peritoneum may or may not be involved. Whether or not the injury is fatal depends largely on the location of the wound; if near the periphery of the organ the prognosis is favorable; if, however, the pelvis is involved the prognosis is bad, as here we get extravasation of urine into the surrounding tissues, and also some of the larger renal vessels may be injured and severe hemorrhage take place. If the peritoneum is involved the extravasation of urine is very apt to set up a generalized peritonitis, and if the peritoneum is not injured the escaping urine may set up a subphrenic abscess. With our present high-velocity and smaller-caliber bullets the destruction of renal tissue should be small and consequently the prognosis better. The angle at which the bullet strikes the organ must also be considered; if it strikes at nearly right angles the laceration may be small; if, however, it strikes at an acute angle more vessels are apt to be injured in its course and consequently more damage to the organ results.

At 10 p. m., December 14, 1915, a Chamorro woman aged 25 was admitted to the naval hospital suffering from a .38-caliber gunshot wound of the abdomen. The shooting had taken place in one of the outlying districts, so that about an hour had been consumed in transferring the patient, this placing the time of injury at about 9 p. m. She was in a very weak condition and soon after admittance passed into a state of shock. Her pulse was rapid and small, temperature subnormal, and extremities cold. She vomited several times a dark brownish fluid, undoubtedly bloody in character. She complained

of great pain in the region of the stomach and also in her back in the region of the left kidney. That night and several times the following day she passed a bloody urine, the blood being bright red, showing an active hemorrhage. Later on dark red blood clots were passed, these clots probably forming in the bladder, as she also complained of severe pain on urination. She complained of great thirst. Her condition excluded any operative interference. At 2.45 p. m. the following day, or about 18 hours after the injury, she died.

On necropsy the following was found: The body was well developed and well nourished; all mucous membranes were very pale. The wound of entrance was in the left side of the chest, 3 inches below the left nipple; it was oval in shape, being one-half inch long and three-eighths inch wide; the lower edge of the wound showed considerable bruising. The wound of exit was in the back about 1¼ inches to the left of the spinal processes and just below the twelfth rib. It was almost circular in shape, about three-eighths of an inch in diameter, and had a few radiating tears. The course of the bullet was downward, inward, and backward, going through the intercostal and pectoral muscles from the point of entrance. It just grazed the upper margin of the seventh rib, stripping off some of the periosteum but not fracturing the rib. It then passed through the lower part of the left pleural cavity, leaving left lung uninjured, and through the diaphragm, making a small nick in the anterior border of the left lobe of the liver. The anterior and posterior walls of the fundus of the stomach were perforated near the middle of this organ. The bullet then entered the kidney on a line with the upper edge of the hilum and almost at right angles to it. The wound of entrance on the anterior surface of kidney was comparatively small, while the wound of exit was large and showed radiating tears. There was a large blood clot about the kidney almost black in color and completely surrounding that organ. After passing through the kidney the bullet then passed through the muscles of the back and out under the twelfth rib. The abdomen was distended and filled with free gas. There was considerable blood in the abdominal cavity and small blood clots were adherent to the intestines. Small amounts of gastric contents were found in the peritoneal cavity, but they were fairly well localized about the wounds of entrance and exit in the stomach.

VESICAL CALCULUS: REPORT OF A CASE.

By T. W. Reed, Passed Assistant Surgeon, United States Navy.

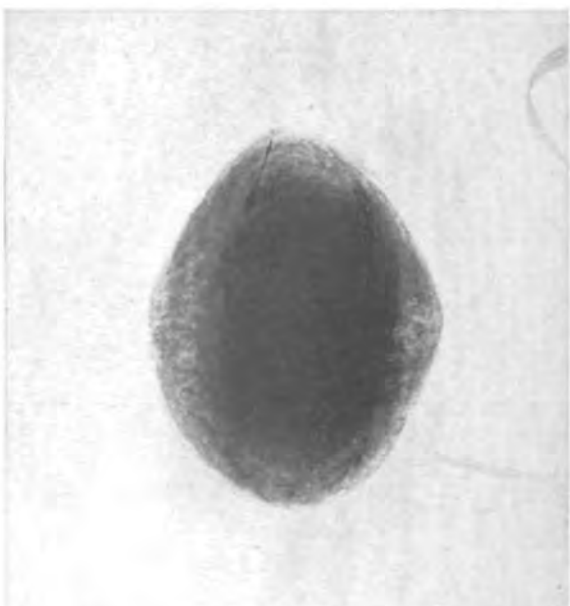
I wish to report the removal of a vesical calculus which weighed 60 grams (930 grains) on March 30, 1916, at the naval hospital, Norfolk, by Surg. W. B. Grove, United States Navy, and the writer.

680—1

Wound of entrance.

Wound of exit.

Reed—Vesical Calculus.



680—2

Roentgenogram of stone. Natural size.

This stone was the size of a hen's egg. It is composed of urates and concentric rings of calcium oxalate, with a colloid nucleus.

This report is made to bring to the attention the fact that large stones do occur in young men—this man was 28 years old—and that the symptoms extended over a period of only two years. Of course this stone may have been passed when a child, from the kidney, as uric-acid stones frequently are, and the patient gradually accommodated himself to the presence of it. Or a mild inflammation or hemorrhage into the bladder may have formed the nucleus. However stones of this size and weight are very infrequent in young men and nowadays, when surgery is so easily resorted to, seldom attain such a size.

A CASE OF GASOLINE POISONING.

By O. C. FOOTE, Assistant Surgeon, United States Navy.

A gunner's mate, first class, aged 30, working on a submarine, had entered the tiller compartment to clean it out. He had taken the usual precaution of tying a line around his waist, placed in charge of a man (tender) outside of the compartment. The manhole to this compartment just permits the passage of a man's body, and is located about 18 inches above the bottom of the compartment, which necessitated entering head first.

The man was lying on his abdomen with his feet presenting toward the manhole and approximately five minutes had elapsed after he entered the compartment when he discovered he was becoming affected by the raw-gasoline fumes escaping from an adjacent gasoline tank. He called for help and before the line tender could haul him out he was so much affected that he was unable to raise his feet to the manhole and steps were taken at once to send in rescuers. Several men were sent in, one at a time, and endeavored to raise him to the manhole, but before they could get him out they would become so affected by the gas it was necessary to bring them out.

In approximately 10 minutes after he called for help he would not answer when called; also his breathing became labored and stertorous, and he could be heard moaning in apparently a delirious manner. This was taken as evidence that he was unconscious.

Due to the construction of the compartment and the man's position and inability to help himself, it required approximately half an hour to rescue him. It was estimated from the length of time we had worked since he responded to call that he had been unconscious for about 20 minutes.

On examination he was found to be cyanotic, unconscious, respirations labored and stertorous, foaming at the mouth, subnormal temperature, pulse about 150 and very weak.

. The pulmotor was applied immediately and in a short time he began to respond and gradually returned to consciousness. He was transferred to the United States Naval Hospital, Norfolk, Va., for treatment, and I am informed made an uneventful recovery.

This case is not reported because gasoline poisoning is a rare condition, but as an example to show the short length of time during which one may reach a serious and helpless condition. The period of 10 minutes given above as the time required to render this man unconscious is considered to be a longer period than actually occurred, but the conditions under which we were working and the end in view made it impossible to obtain accurate figures.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

E. THOMPSON and J. A. RANDALL, Surgeons, United States Navy.

TICE, F. **Coleman diet in typhoid fever.** Med. Clin. of Chicago, March, 1916.

The author states that after considerable experience with various typhoid-fever diets he has adopted the Coleman plan, as advocated by Dr. F. C. Coleman, of New York.

It may be of some interest to discuss this diet in detail. It must, of course, be first understood that no diet can be a laid-down, fixed rule; every case of typhoid must be treated individually. The principal thing is to maintain and protect the body tissues. It is well known that under the straight liquid diets patients lost greatly in flesh and often left the institutions emaciated, complications were frequent, and convalescence greatly retarded.

Typhoid patients should be watched to see if they are maintaining or losing weight, and second as to the condition of their appetites.

If the patient on a diet is apparently not losing weight and does not complain of hunger we are justified in believing that the diet is meeting the necessary requirements. As to a more definite rule in formulating a dietary, we must bear in mind the conclusions of Dr. Coleman: "A normal man at ordinary rest requires about 33 calories per kilo of body weight each day; the average typhoid requires a 25-per cent addition to meet the febrile increase in heat production; this gives 40 calories per kilo of body weight per day, or approximately 3,000 calories for a man weighing 150 pounds," and his "best results were obtained when the diet furnished 60 to 80 calories per kilo per day, or 4,000 or 5,000 calories."

In formulating a diet for any particular patient it is not only necessary to know the body weight and the required calories but also the approximate caloric value of the articles of food. The following tables (despite a regrettable multiplicity of standards), as given by Dr. Coleman, will be of service:

		Calories.
Apple sauce	1 ounce	30
Bread, average slice	33 grams	80
Butter, 1 pat	⅓ ounce	80
Cereal, cooked	1½ ounces	50
Crackers	1 ounce	114
Cream (20 per cent)	1 ounce	60
Egg, 1	2 ounces	80

		Calories.
Egg (white), 1		30
Egg (yolk), 1		50
Lactose, 1 tablespoonful	9 grams	36
Milk, whole (1 pint, 350)	1 ounce	20
Potato (whole)	1 medium	90
Potato (mashed)	1 tablespoonful	70
Rice (boiled)	1 tablespoonful	60
Sugar, cane	1 lump	16
Sugar, milk, 1 tablespoonful	9 grams	36
Toast, average slice		80

For convenience, Dr. Coleman directs that the milk sugar be measured in the ordinary medicine glass; each measured ounce equals 18 grams in weight, or 72 calories. The sugar is soluble in boiling water in the proportion of 24 grams to 30 milliliters.[1]

The following are the actual diet tables which have been found of use by Dr. Coleman; Nos. 1 and 2 are used in the early part of the disease, according to indication, No. 3 is only employed when the patient is well on toward convalescence.

TYPHOID DIET NO. 1.

[Diet furnishing 3,910 calories.]

			Calories.
Milk, 6 ounces	Hours: 9 a. m.; 1, 3, 7, 10 p. m.; 1, 4 a. m.	total, 1,260 mils[1]	860
Cream, 2 ounces		total, 420 mils[1]	840
Lactose, 10 grams		total, 70 grams	280
			1,980

7 a. m.:	
Egg, 1	80
Toast, 1 slice	80
Butter, 20 grams	150
Coffee	---
Cream, 2 ounces	120
Lactose, 20 grams	80
	510
11 a. m.:	
Egg, 1	80
Mashed potato, 20 grams	20
Custard, 4 ounces	270
Toast (or bread), 1 slice	80
Butter, 20 grams	150
Coffee	---
Cream, 2 ounces	120
Lactose, 20 grams	80
	780

[1] Milliliter and mil have been adopted as official in place of cubic centimeter and c. c., respectively. See page 721.

5 p. m.:	Calories.
Egg, 1	80
Cereal, 3 tablespoonfuls	150
Cream, 2 ounces	120
Apple sauce, 1 ounce	30
Tea	---
Cream, 3 ounces	180
Lactose, 20 grams	80
	640

TYPHOID DIET NO. 2.

[Diet furnishing 5,580 calories.]

			Calories.
Milk, 5 ounces	Hours: 9, 11 a. m.; 1, 3, 7, 10 p. m.; 1, 4 a. m.	total, 1,200 mils	820
Cream, 2 ounces		total, 720 mils	1,440
Lactose, 15 grams		total, 120 grams	480
			2,740

7 a. m.:	
Egg, 1	80
Toast, 2 slices	160
Butter, 20 grams	150
Coffee	---
Cream, 2 ounces	180
Lactose, 20 grams	80
	650

5 p. m.:	
Egg, 1	80
Toast, 2 slices	160
Butter, 20 grams	150
Cereal, 6 tablespoonfuls	290
Cream, 4 ounces	240
Apple sauce, 1 ounce	30
Tea	---
Cream, 2 ounces	120
Lactose, 20 grams	80
	1,150

11 a. m.:	
Eggs, 2	160
Toast, 2 slices	160
Butter, 20 grams	150
Mashed potato, 70 grams	70
Custard, 8 ounces	500
	1,040

TYPHOID DIET NO. 3.

[Diet furnishing 5,570 calories.]

			Calories.
Milk, 5 ounces	Hours: 9, 11 a. m.; 1, 7,	total, 1,050 mils	700
Cream, 3 ounces	10 p. m.; 1, 4 a. m.	total, 630 mils	1,280
Lactose, 15 grams		total, 105 grams	420
			2,380
11 a. m.:			
Eggs, 2			160
Mashed potato, 80 grams			80
Custard, 8 ounces			500
Creamed chicken, 1 ounce			50
Toast, 2 slices			160
Butter, 20 grams			150
			1,100
5 p. m.:			
Toast, 2 slices			160
Cereal, 6 tablespoonfuls			290
Cream, 2 ounces			120
Lactose, 20 grams			80
			650
3 p. m.:			
Lemonade (lactose), 20 grams			480
7 p. m.:			
Egg, 1			80
Cereal, 5 tablespoonfuls			250
Cream, 2 ounces			120
Toast, 2 slices			160
Butter, 20 grams			150
Coffee			---
Cream, 2 ounces			120
Lactose, 20 grams			80
			960

Considerable criticism has been evolved from time to time, particularly during the earlier observations, by this increased diet in typhoid. As a matter of fact, complications such as hemorrhage and perforations are certainly greatly reduced since the advent of this treatment, and patients leave the hospital in a very much better physical condition than they did under the old régime of the milk diet.—(W. S. PUGH.)

BLACKFAN, K. D. Cutaneous reaction from proteins in eczema. Am. Jour. Dis. Child., ii, No. 6, June, 1916.

After a résumé of the work which has been done on this subject and a statement of several case reports, the author concluded with the following summary:

Of 43 patients without eczema, only 1 showed any evidence of susceptibility to protein by cutaneous and intracutaneous tests.

Of 27 patients with eczema, 22 gave evidence of susceptibility to proteins. Egg white, cow's milk, and woman's milk were the substances that most frequently caused a reaction. If there was a reaction from one protein there usually was a reaction from several.

The intracutaneous test is more delicate than the cutaneous, but gives results that are more difficult to interpret.

The removal of some or all of the animal proteins from the food brings about great improvement in some cases of eczema in older children and adults. With infants it is not successful, first, because it is impossible to feed an infant for a long time upon a diet that contains no animal protein without the risk of seriously affecting his nutrition, and second, because there is a strong tendency for the eczema to return, even though a protein-poor diet produces early improvement, and even though the protein-poor diet is continued.—(W. E. EATON.)

CLARK, W. L. Some therapeutic uses for the ultraviolet rays. Jour. Electrotherap. and Radiol, April, 1916.

The treatment of port-wine marks, nevi, telangiectasis, and rosacea with ultraviolet rays from an intense radiating source has been effective in their removal in varying degrees. In those which are superficial and characterized by red or bluish-red color based on subepidermal dilatation without a large measure of arterial element, the removal is generally complete. When hypertrophy of the connective tissues is present the ultraviolet rays are less effective even after repeated radiations, and a complete removal is not obtained, though there may be marked improvement.

It is a well-recognized fact that the penetrating quality of ultraviolet rays either from artificial sources or from the sun's rays does not penetrate far into the skin. They have the property, however, of tanning the skin, blonds being more susceptible to them than brunettes, which is probably due to the greater contrast of the surrounding skin. It was demonstrated by Bordier and Nogier, in 1908, that this action was due to the absorption of the rays by the blood and it was further demonstrated by them as it had been previously by Finsen that these rays did not penetrate substances containing

blood or red coloring matter. Likewise they are less energetic when a pigment is present in the skin, as in brunettes, and in all cases after tanning has once taken place.

As was demonstrated by Finsen when the tissues were firmly compressed, thereby being rendered anemic, the rays did penetrate to a depth of from one to four millimeters and it has been shown that under these conditions they have penetrated even deeper. The violet reactions which take place under exposure to the sun's rays from which the ultraviolet has not been filtered as from these artificial rays of high intensity, are among the characteristic actions of the ultraviolet rays. They do not, however, penetrate thin films of glass but readily penetrate water, air, and rock crystal. A thin thickness of thin dark cloth or adhesive plaster will absolutely prevent the passage of the rays and may be used for the protection of the eyes during treatment. Also a thin disk of quartz, colored blue, is interposed to filter the red, yellow, and green radiations, preventing the thermic actions of these rays upon the skin which would be irritating when used with such intensity. It has also been found that there is greater penetration when the blue filter is used.

The effect upon a port-wine mark or nevus and similar affections of the skin, when compressed and used with the blue-quartz filter, is to produce a thrombosis and inflammatory reaction of the capillaries of the nevus, of sufficient intensity to cause absorption, and further loss of function with ultimate obliteration. But few applications are necessary, which will vary with the characteristic of the part involved as to depth, the amount of pigment in the skin, the relative strength of the rays employed, the length of exposure, and the thickness of the blue-glass filter. It is necessary to make the exposures longer, relative to the thickness of the filter. Three millimeters of filter is the most satisfactory thickness. Another point to be remembered is that brunettes, for obvious reasons, require longer treatments than blonds. The rule which may be employed is that a port-wine mark which disappears readily under pressure should respond to exposures of 40 minutes if the connecting tissue is not thickened. If it does not fade readily under treatment it may require four 40-minute exposures. These figures must be considered as relative and not arbitrary. Some cases require more and others less to effect a removal.

Normal skin is more susceptible to the ultraviolet rays than skin which is congested. It is, therefore, necessary to protect the normal skin surrounding the part under treatment. The author's method of accomplishing this is to protect all except the part to be treated by placing zinc-oxid plaster over it. The hands of the operator should always be protected with gloves.—(E. T.)

MENTAL AND NERVOUS DISEASES.

R. SHEEHAN, Passed Assistant Surgeon, United States Navy.

HOLMES, G. **Spinal injuries of warfare. Third Goulstonian Lecture.** Brit. Med. Jour., Dec. 11, 1915.

It is profitable to consider the conclusions made by this eminent neurologist. The entire lecture is of great interest, but the factors of prognosis and treatment are of particular value.

The prognosis during the first two weeks in any one case is extremely difficult, and it must be admitted that there is no one sign or symptom from which we can draw reliable conclusions on the severity of the lesion, or from which we can say, when there is complete motor and sensory paralysis, as there nearly always is in the earliest stages, whether the cord is completely divided or not. It must be remembered that though neither the cells nor the fibers of the spinal cord do regenerate, very considerable improvement may occur, as at least part of the early symptoms are due to edema, circulatory disturbances, and to incomplete damage. The structural damage is consequently not always parallel to the functional loss. We have seen that the knee jerks are absent for a time with lesions of all degrees of severity, and this consequently can not be a guide in prognosis. The most reliable information is perhaps given by the state of tone in the muscles of the lower limbs; after three or four days the legs are generally very flaccid and their muscles toneless when the lesion is severe and irrecoverable, and gradually become more so and waste. The preservation of tone in the muscles is, on the other hand, an indication that some improvement may be expected. Valuable information can be also obtained by stimulation of the soles, as the amount of reflex movement that results varies more or less inversely with the severity of the injury. When this is complete, no reflex muscle contraction can be, as a rule, elicited, while in all stages of slighter damage a brisk withdrawal reflex can be obtained.

Probably no serviceable recovery can be expected if the plantar responses are flexor.

In less severe cases in which all forms of sensation are not abolished, the amount of disturbance of the latter is an indication of the amount of the cord damaged; we have generally seen the promise of useful recovery when tactile stimuli could be felt in the lower limbs within the first two or three days.

When the cervical region is injured the upper limbs are usually more paralyzed than the lower, and remain flaccid and waste while these show signs of recovery; histological examination shows that

this atrophic palsy of the arms is due to extensive softening of and hemorrhages into the ventral horns, and as the motor cells contained in them are readily destroyed the chance of much improvement is slight.

If recovery sets in early, steadily progressive improvement may be, however, expected, unless complications occur. In a few patients, however, the symptoms increased after movement. One lost again the power of movement he had regained in his right leg during his transference to England; and in one other case observed syringomyelia developed some time after the infliction of the injury.

TREATMENT.—Owing to the nature of the lesions the treatment of these spinal injuries is naturally unpromising. The damage to the spinal cord is done when the wound is inflicted, and we are unable to influence it by treatment. In many cases surgical intervention and the removal of missiles or displaced bone which compress the cord have given a hope of greater recovery, and should be attempted if the symptoms or an X-ray examination make it probable that the cord is compressed, and that there is any prospect of recovery. But it must be realized that in such cases the symptoms are certainly more dependent on intramedullary changes produced at the time rather than on compression.

Dr. A. R. Allen showed experimentally some years ago that the symptoms produced by severe contusion of the cord can be relieved and recovery made possible by incising the dorsal columns at the level of the injury, thus draining away edematous fluid and intramedullary hemorrhages, and allowing the swollen fibers to expand, but it is necessary that this operation should be performed within a few hours of the infliction of the injury. This is rarely possible in warfare, and the early symptoms are so equivocal that if resorted to more harm than good might be easily done.

A large proportion of cases of spinal injury die soon after the infliction of the wound from shock or associated wounds of the chest or abdomen. Among those that survive, the greatest danger is from cystitis and pyelonephritis and the development of extensive bed sores. A large part of the responsibility consequently falls on the nursing. When cystitis is threatened or has developed, we have seen excellent results from suprapubic draining. Finally, the danger of moving the patient must be borne in mind; the risk is obvious if the vertebral column is fractured, and if detached pieces of bone lie within the canal these may be displaced and lacerate the cord during transit. Further, we have evidence that secondary changes are more liable to develop after movement; absolute rest is consequently advisable during the first few weeks if the symptoms hold out any prospect of useful recovery.—(R. S.)

SOLOMON, H. C., KOEFOD, H. O., and WELLES, E. S. **Diagnostic value of Lange's gold sol test. (Based on 500 examinations of the spinal fluid.) Boston Med. and Surg. Jour., December 23, 1915.**

This is one of a number of recent contributions on the value of the colloidal gold test. The concensus of opinion seems to be that it is a valuable diagnostic measure. The writers conclude that—

1. Fluids from cases of general paresis will give a strong and fairly characteristic reaction, especially if more than one sample is tested, in the vast majority of cases.

2. Very rarely general paresis fluid will give a reaction weaker than the characteristic one.

3. Fluids from cases of syphilitic involvement of the central nervous system other than general paresis often give a weaker reaction than the paretic, but in a fairly high percentage of cases give the same reaction as the paretics.

4. Nonsyphilitic cases may give the same reaction as the paretics; these cases are usually chronic inflammatory conditions of the central nervous system.

5. When a syphilitic fluid does not give the strong "paretic reaction" it is good presumptive evidence that the case is not general paresis, and this test offers a very valuable differential diagnostic aid between general paresis, tabes, and cerebrospinal syphilis.

6. The term "syphilitic zone" is a misnomer, as nonsyphilitic as well as syphilitic cases give reactions in this zone, but no fluid of a case with syphilitic central nervous system disease has given a reaction out of this zone, so that negatively it may be used, and any fluid giving a reaction outside of this zone may be considered nonsyphilitic.

7. Light reactions may occur without any evident significance, while a reaction of no greater strength may mean marked inflammatory reaction.

8. Tuberculous meningitis, brain tumor, and purulent meningitis fluids characteristically, though not invariably, give reactions in higher dilutions than syphilitic fluids.

9. The unsupplemented gold sol test is insufficient evidence on which to make any diagnosis, but used in conjunction with the Wassermann reaction, chemical and cytological examinations, it offers much information aiding toward the differential diagnosis of general paresis, cerebrospinal syphilis, tabes dorsalis, brain tumor, tuberculous meningitis, and purulent meningitis.

10. We believe that no cerebrospinal fluid examination is complete for clinical purposes without the gold sol test.—(R. S.).

Von Schneider, C. **Studies on alcoholic hallucinoses.** Psychiat. Bull., January, 1916.

The writer has covered the literature in a careful and profitable way, and his conclusions are illuminating and valuable. They do much to accentuate the growing idea that alcoholism is really symptomatic. As he states, "a person may use alcohol to excess and remain normal, or develop a different psychosis from the hallucinosis after its use, or develop an identical hallucinosis without alcohol or other toxic substance; that the question of its (alcohol's) place as a factor is not settled. It is quite as easy to show that the hallucinosis developed in spite of, as because of, the alcoholic indulgence; not one spree in a thousand is followed by an hallucinosis: hence it is obvious that when cases succumb we must seek another factor, and it is generally at hand, i. e., there are factors which stand out prominently to differentiate the spree that is followed by a psychosis from the one that is not."

The conclusions made are:

"1. Alcohol as an hereditary or etiological factor in the production of 'insanity' has been overrated, incidence being confused with cause.

"2. Alcoholic hallucinoses are separate and distinct from the toxic Korsakoff and delirium tremens, and show no mental or physical signs of a toxic psychosis.

"3. The patients who develop hallucinoses are opposed to the homosexual in physical traits, mental characteristics, civil condition, occupation, and general reaction to sexual subjects.

"4. The alcoholic hallucinoses can not be classed with dementia precox because the make-up, the age of onset, the etiology, the suddenness of the onset, the short duration, the complete recovery with unusually good insight and interest and confidence in the future, and the fact that persons developing dementia precox are not addicted to alcohol are directly opposed to this classification.

"5. That the alcoholic hallucinoses are purely functional and allied to the manic-depressive psychosis and to the recoverable non-alcoholic episodes, hallucinatory and otherwise, in the constitutionally inferior, is indicated by facts gathered from the studies of psychiatry of races, of make-up, etiology, and outcome. Moreover, the manic-depressive individual is notably given to alcoholic excesses, and manic-depressive attacks and hallucinoses are produced in the same person, and in different persons, by exactly the same factors, including alcohol.

"6. Alcoholic hallucinosis is a misleading title for the psychosis, because definite precipitating factors other than alcohol are present and necessary in its production, and are often reproduced in the psychosis, which shows their importance; because alcohol is not the

only factor or the most important factor or even a necessary factor in its production, as shown by numerous hallucinoses identical in course and outcome, where alcohol and other toxic factors can be excluded; because debauches, both before and after attacks, when the mental precipitating factor is absent, cause no difficulty; because other psychoses in the same individuals, in which alcohol plays the same part, are not called alcoholic."—(R. S.)

ANDERSON, V. V. **The alcoholic as seen in court.** Boston Med. and Surg. Jour., April 6, 1916.

This was a study of 100 alcoholics who had been repeatedly arrested for drunkenness, who had as a result spent much of their time in and out of penal institutions, and whose conduct seemed little modified by such treatment. It was ascertained:

1. That not more than one-half were capable of supporting themselves out in society.

2. That 77 per cent showed inferior mentality, while 56 per cent had the mental level of children below the age of 12 years.

3. That they were all suffering from conditions regarded as medical problems.

For purposes of treatment they, in general, may be divided in two broad classes:

(*a*) The steady drinker, whose mentality is either defective to begin with or is so deteriorated from the insidious effects of alcohol as to require that he be confined for prolonged hospital care and treatment; and—

(*b*) The periodic drinker, who though in many instances may require short periods of detention, as well as hospital treatment, is in general to be handled on probation and incorporated into society's scheme of living by means of well-directed medical, psychological, and social-service methods of treatment, methods that take full account of his peculiar mental make-up, his character defects, and temperamental difficulties.—(R. S.)

COTTON, H. A. **Effects of syphilis upon the central nervous system. Methods and results of treatment.** Jour. Med. Soc. New Jersey, January, 1916.

The writer has done considerable valuable work in the treatment of cerebrospinal syphilis, and his conclusions merit attention. He emphasizes the following points:

First. That paresis in the incipient stages is a curable disease; that treatment with salvarsanized serum must be begun early to be of any value.

Second. That 25 per cent of the cases admitted to the hospital respond to treatment in mild cases, often after a duration of one to three years.

Third. That the majority of patients admitted to the State hospital after a duration of two years of paresis are beyond hope of treatment.

Fourth. That the diagnosis of paresis in the incipient stage is not difficult, and should easily be made by every physician.

Fifth. The most important physical signs in the order of their importance are: (*a*) Changes in the cutaneous sensibilities, both objective and subjective; (*b*) pupillary disturbance (sluggish or stiff to light); (*c*) change in the character of the knee jerks, absent, exaggerated, or unequal; (*d*) disturbance of micturition; (*e*) persistent headache and dizziness; (*f*) optic neuritis and specific changes in the disk; (*g*) convulsions; (*h*) high blood pressure.

Sixth. Mental symptoms are of less diagnostic importance in the early stages, as the symptoms of paresis may be found in many other psychoses, but the following symptoms would make one suspicious: Neurasthenic condition with marked loss of memory, indifference to surroundings, changes in habits and personality, changes in disposition, loss of moral and ethical judgment, tendency to extravagance and expansive ideas for the expansive type. The depressed type may show the same mental symptoms with the exception that patient is depressed and has ideas of poverty, unworthiness, etc., and the demented type without any marked exaltation or depression of delusional formation.

Seventh. All cases showing a suspicion of early paresis should have a lumbar puncture made and spinal fluid examined for increase in the cells, increase in the globulin content, colloidal-gold reaction, and Wassermann test made of the blood and spinal fluid.

Eighth. In the majority of cases these tests will be positive and at least one of them will be positive in every case.

Ninth. With the above clinical and serological methods of diagnosis there is no reason why every case of paresis should not be detected in the incipient stage and treatment immediately instituted.—(R. S.)

LOWREY, L. G. **The Wassermann test in practical psychiatry.** Am. Jour. Insan., April, 1916.

This is an analysis of the results on 1,600 admissions to the Danvers State Hospital. Briefly the conclusions were as follows:

Of the 864 male cases tested, 164, or 19 per cent, were positive; of 736 female cases, 92, or 12.5 per cent, gave positive tests. Of the 1,600 cases tested, 256, or 16 per cent, were positive. Doubtful tests occurred in 3.87 per cent of cases.

Including cases with positive spinal-fluid test and negative or doubtful blood test, 273, or 17 per cent of 1,600 admissions, gave a positive test at some point. Of the 164 positive blood tests among

males, 113, or 68.8 per cent, occurred in cases of syphilis of the nervous system. Of 92 females with positive blood test, 32, or 34.8 per cent, were paretics. Of 256 cases with positive blood test, 145, or 56.7 per cent, were cases of syphilis of the nervous system. Excluding paretics from all figures, positive tests occurred in 7.6 per cent of 1,455 admissions.

Of the nonparetic cases with positive blood, 20 are "organic," 80 are "functional," and 10 are "unclassified."

It appears that if an insane man has a positive blood test, the chances are better than even that he will be a paretic, while if a positive test appears in an insane female, the chances are that she will not be a paretic. When paresis is excluded the chances are about three in four that the person with positive blood will have a "functional" psychosis. An unexplained finding is the high percentage of positive blood tests among morphin habitués. No other nonparetic group contains any considerable group of cases with positive Wassermann. A person suffering from any psychosis may be syphilitic without having syphilis of the central nervous system. Doubtful Wassermann tests later show positive reactions in blood or spinal fluid in about one-quarter of the cases. The tests should always be repeated.

Among the paretics of this series the blood test was positive in 87.5 per cent and negative in 10.3 per cent. The spinal-fluid test was positive in 87.2 per cent and negative in 8.5 per cent, while the test was positive in both fluids in 75 per cent of cases. Of 276 cases with test in the spinal fluid there were 126 positive results. Of these 109 had blood and fluid test both positive; 5 had doubtful blood and positive fluid; 12 had negative blood and positive fluid test. Of the 126 cases with positive fluid test, 121 were paretics, 2 imbeciles, 1 was organic dementia, 1 a heroin habitué, 1 psychoneurotic. The latter 5 may in time develop paresis.

These figures give evidence of the great practical value of the Wassermann reaction in psychiatry.—(R. S.)

ROSSY, C. S. **Abstract of a psychological study of three hundred prisoners in the Massachusetts State Prison.** Jour. Abnorm. Psychol., April–May, 1916.

This paper reports a psychological investigation made for the purpose of determining the number of mentally deficient individuals confined in the prison. The status of intelligence was ascertained by the Yerkes-Bridges Point Scale.

The diagnosis of mental deficiency or feeblemindedness was made on the basis of a positive history and a low intellectual grading. A comprehensive history was made to determine whether or not the low intellectual grading was due to permanent mental defect or

temporary impairment. The investigation included the following fields: (*a*) Medical history and physical examination; (*b*) family history; (*c*) personal and developmental history; (*d*) history of school progress; (*e*) social history; (*f*) moral reaction; (*g*) economic efficiency; (*h*) practical knowledge.

The results showed that 22 per cent of the subjects were feebleminded; 9.6 per cent borderline cases; 3.3 per cent probably psychotic. The 22 per cent feebleminded were custodial cases in so far as their deficient mentality and significant history indicate the need of supervision.

The subjects were classified also according to the following headings: (1) Sex offenses; (2) crimes against property; (3) crimes against life. Computations on these bases showed the following facts: (1) The highest percentage of feebleminded individuals is found among prisoners guilty of sex offenses, and the lowest percentage among prisoners guilty of crimes against property. (2) The percentage of probably psychotic subjects is highest among prisoners guilty of crimes against life.—(R. S.)

SURGERY.

A. M. FAUNTLEROY, Surgeon, and E. H. H. OLD, Passed Assistant Surgeon, United States Navy.

FALKNER, P. H. **A canvas sling for loading wounded from barges and boats into hospital transports.** Jour. Roy. Army Med. Corps, xxv, No. 3, September, 1915.

The device is designed to facilitate the passing of regulation Army litters from boats to ships and vice versa.

After dwelling upon the disadvantages of other appliances, including "cradles," etc., the following description, with figures, appears:

The contrivance is composed of "O" canvas, 1-inch pliable wire rope, two 5-inch iron rings, and four small hooks to secure the end flaps (fig. 1). Wood does not form any part of the sling, and we are satisfied it should not do so.

The base measures 6 feet 10 inches by 2 feet (6 feet by 1 foot 10 inches for the United States Army litter), just sufficient to cover the under surface of the regulation stretcher, and allow its four feet to enter the round holes at each end (changed to oblong in sketch to take feet of United States Army litter).

From ring to ring the sling measures 12 feet 9 inches, while 2 feet 2 inches is a good length for the two end flaps. These flaps are hooked up to four eyelets, located on the edges of the triangular sides, so that they pass between the stretcher handles when the stretcher is in position, and the iron rings are approximated to take the winch hook.

The diagram (fig. 1) illustrates a complete circumference of wire rope for the body of the sling. It should, of course, pass inside a casing of canvas and not be merely sewn to the edges of the cloth; it takes practically the whole weight of the stretcher.

Figure 2 illustrates the stretcher in position and safe from all risk, provided the winch is operated in a reasonable manner. The inward pressure from the two stretcher poles is probably no greater now than when the patient is carried by hand; so that the traverses

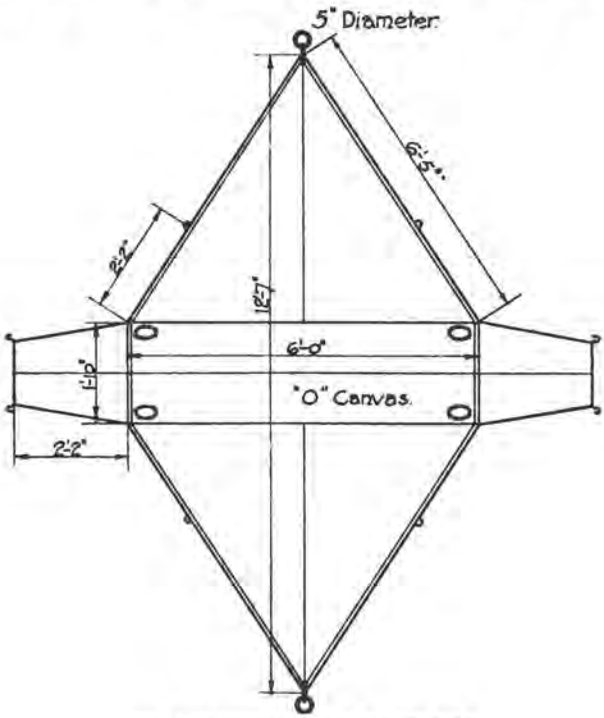


FIG. 1.—General plan of canvas sling.

have no tendency to collapse. Should they do so, there is no risk involved.

The first stretcher to come up will probably be the most difficult one to handle, owing to lack of space in the barge. Therefore the sling may be rolled up from one of the peaks to the center of its floor and passed sideways into position beneath the stretcher after the manner of a draw sheet. If, on the other hand, it appears more convenient to slip the canvas under from one end of stretcher, roll up the sling crosswise from one flap to the other and place it so that the four feet are taken into the holes provided for them.

No time is lost. One after another the slings are fitted to the stretchers in the boat, while the empty slings coming from the deck

above do so as small compact bundles (fig. 3) that can not injure any one. In practice, and working without great skill or effort, it will take about one minute to land each patient on the ship's deck.

When the patient reaches the deck (fig. 2), two bearers take the stretcher handles without stooping, while the winch rope is slack-

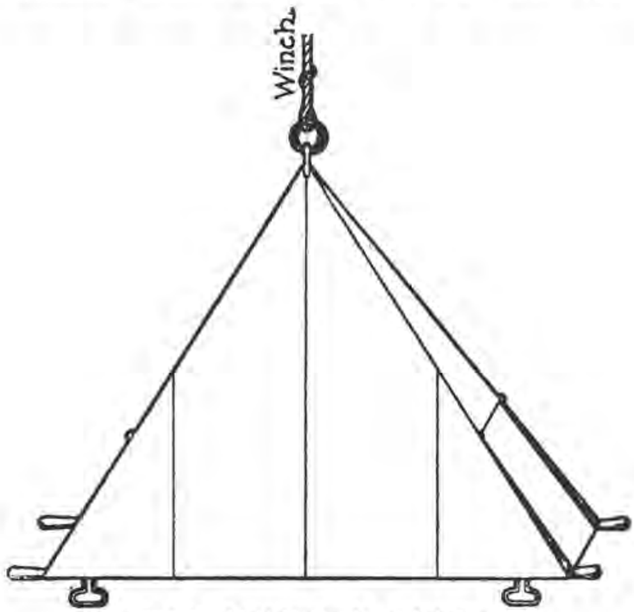


FIG. 2.—Stretcher ready for hoisting.

ened off to unhook the rings. The sling is then rapidly cast off, and falls to the deck while the bearers move forward with the patient.

By slightly changing measurements of the "base" to conform to the United States Army litter, the device would meet all requirements in our service for which it is intended, and the facility and expedition dwelt upon certainly merit a trial.

In the sketches, measurements have been revised to meet the dimensions of the United States Army regulation litter.—(C. B. CAMERER.)

FIG. 3.—Empty sling done up for lowering.

LOBCHER. **Open wound treatment with cotton rings and gauze cover.** München. med. Wchnschr., Feldärztliche Beilage, October 19, 1915.

The writer, who is chief of a field hospital, states that months of extensive use of the dressing he describes have shown that wounds so protected by, but not in contact with, a gauze filter covering, will

bear exposure to air currents and that they heal as well and clean themselves faster than wounds treated by methods hitherto in use. The author's dressing consists of a ring of cotton made by bringing a "sausage" of cotton end to end slightly overlapping and winding it about with gauze bandage to resemble a lifebuoy. These are either made of sterile material with sterile hands and kept in suitable containers or may be sterilized after being made. The wound is cleansed, the surrounding area wiped with benzin, and a solution of mastic applied with a hair pencil around the wound. The ring is then pressed on and a veil of gauze stretched over it, the edges being secured to the skin by the mastic solution. The rings can be made of all sizes and formed into various shapes and may be adjusted to any part of the body. Painting the gauze with iodin is said to make it more transparent for inspection of the wound. A "beehive" dressing with open top may be made where extraordinary protection is necessary—this is accomplished by superimposing rings of smaller diameter upon each other. Large rings should be bridged over with a few sterile wires to keep the gauze cover from the wound surface.

The advantages claimed for open wound treatment and for this particular dressing are: Pressure and local irritation incident to pressure are eliminated; irritation caused by the chemical changes going on in a moist dressing taking up wound discharges are absent, the circulation is not interferred with—shifting of the dressing can not take place; it carries out completely the idea of a truly dry dressing which can not be said of a closed bandage dressing. On account of this drying quality, however, this method of treatment is not indicated in deep wounds where there is much exposure of muscle tissue or of nerves and vessels which are injuriously affected by being deprived of their physiological moisture.

This method of treatment commends itself further by the saving of time to the surgeon as well as attendants; wounds are easily and quickly inspected; secondary hemorrhage is promptly detected; granulations are not disturbed by changes of dressing and these changes are painless; no bleeding is induced by change of dressing material which, in time of war, and particularly in field hospitals, is a most important consideration.—(P. J. WALDNER.)

BALDWIN, J. F. **Nitrous oxid-oxygen, the most dangerous anesthetic.** Med. Rec., New York, July 29, 1916.

In this very valuable contribution to conservative surgery the author carefully analyses the claims made in recent years as regards nitrous oxid-oxygen anesthesia. He quotes a number of recently

received personal communications from surgeons and anesthetists of large experience which unmistakably point to the fact that nitrous oxid-oxygen has been weighed in the balance and found decidedly wanting. He brings out the fact that in the investigations of others as well as himself there have been quite a conspicuous number of unreported deaths from the use of this anesthetic.

The following is a quotation: "If the sponsors of the new anesthetic were actuated purely by scientific motives every unsatisfactory experience and certainly every death would be promptly reported, so that the profession at large could judge as to the relative value of the new anesthetic; while if such adverse experiences are not reported, but attempts are even made to cover up and deny their occurrence, then only mercenary motives can be attributed to the advocates. Teter, of Cleveland, in a personal letter, reports that he knows of 26 nitrous oxid-oxygen fatalities, 9 of which occurred in Cleveland. Dr. A. H. Miller, of Providence, R. I., has collected references to 18 deaths. Rovsing was able to get track of 13 deaths, several of which had been suppressed. (This author, in his chapter on anesthesia, gives a death rate of 1 in 2,000 for chloroform and 1 in 50,000 for ether). Gwathmey (personal communication) knows of from 20 to 40 unreported deaths."

Another quotation: "Gwathmey, concerning whose skill and experience there can be no doubt, under date of November 6, 1915, gives me a personal report of a death which he had a few days before and which he expects to report at an early date. This death under nitrous oxid-oxygen, he says, 'was absolutely uncalled for and has changed my ideas of the safety of nitrous oxid-oxygen entirely. * * * I believe if I had given him ether the man would have been alive today.'"

In view of the above, Ochsner's comment on nitrous oxid-oxygen is illuminating. He says that he made a careful test with 100 successive cases of nitrous oxid-oxygen anesthesia, compared with a similar number of ether anesthesias by the drop method. He says: "I found no difference in the course of the anesthesia, nor in the comfort of the patient, but that there was a little more bronchial irritation following operation when nitrous oxid-oxygen had been used." (Absence of bronchial irritation is one of the strong claims made by those who advise this anesthetic.) The method, he says, he found cumbersome, and therefore permanently abandoned it. The only special advantage he attributed to it was "a slight advertising value which the method undoubtedly possesses." He then speaks of the addition of oxygen to the nitrous-oxid gas, and claims the same advertising value as for the other, but "possibly to a somewhat greater degree." He then speaks of some of the disadvantages which it has and finally concludes as follows: "For some time to come

there will be a certain amount of advertising advantage, but as soon as this has been dissipated through the fact that everyone will be prepared to administer this form of anesthesia, its drawbacks must become apparent as compared to its advantages."

After quoting Rovsing, who calls attention to Mikulicz's report of 1898 with reference to the somewhat frequent occurrence of postoperative pneumonia, the author goes on to disprove conclusively the old conception that postoperative pneumonias were narcosis pneumonias.

In concluding his paper the author says: "I have had ether administered in very many thousands of cases; years ago by the use of the old-fashioned cone, then the Allis inhaler, and now for a number of years by some form of the drop method. I have never had a death on the table from its administration. I can not recall a single death from postoperative pneumonia. I have had two or perhaps three deaths from suppression of urine. It is possible, perhaps probable, that this suppression was the result of the action of the ether on the kidneys, and yet we all know that deaths from suppression occur in cases in which no anesthetic whatever has been given, and earlier in this paper I have referred to one death in which suppression of the urine followed the administration of nitrous oxid-oxygen.

"Nitrous oxid-oxygen has a field of usefulness to which it should be strictly limited. It can be used for very brief operations, as it has been for many years in the extraction of teeth. It is also probably the safest anesthetic to use, as suggested by Ochsner, in cases of acute pulmonary congestion, or of acute nephritis. With these exceptions, which make its field a very limited one, nitrous oxid-oxygen should be looked upon as the most dangerous anesthetic that can be used, even in the hands of the most experienced."—(A. M. F.)

CRILE, G. W. **The treatment of peritonitis.** Cleveland Med. Jour., April, 1916.

The common cause of death in peritonitis as in any acute infection is exhaustion, this exhaustion being due to (*a*) the expenditure of energy in combatting the infection; (*b*) the destructive effects of the resulting acid by-products; (*c*) the diminished intake of food; and (*d*) insufficient sleep.

The last-named factor often escapes notice, yet it is potent in its effect, for restoration from exhaustion is accomplished largely through sleep. Peritonitis is one of the most painful of diseases, and during its acute phases sleep is rare and fitful.

The treatment of peritonitis therefore resolves itself into four principal phases: (*a*) Diminishing the absorption of toxins; (*b*) diminishing the response to infection; (*c*) promoting the elimination of acid by-products; (*d*) securing sleep.

Diminishing the absorption of toxins: To diminish the absorption of toxins tension is relieved and drainage secured in the least harmful manner—by operating under nitrous-oxid and local anesthesia combined; by the Fowler posture; by the physiologic rest of the intestines.

Diminishing the response to infection: The body's response to infection is chemical and is initiated and continued by the brain. The intensity of the response, therefore, is controlled by controlling the brain itself and the one agent that can accomplish this end is opium. The clinician's knowledge of the value of opium is now supplemented by laboratory findings which demonstrate that opium measurably protects the brain, the adrenals, and the liver against the damaging effects of toxins. The dosage of opium must be governed by the intensity of the infection. Alonzo Clark's original communications regarding the use of opium in peritonitis are most illuminating, and his dictum that the dose should be measured by its effect upon the respiratory rate is correct. As the opium is pushed the pulse and respiratory rates decrease and the temperature falls; and in the resultant narcosis the appearance of the patient misleads the superficial observer, for the relaxed facial muscles suggest a grave condition that does not exist.

In the state of opium narcosis metabolism is held practically at a standstill, and little food is required—hence, in this respect also the patient is conserved.

In the Lakeside clinic morphin is given in one-sixth grain doses as required to hold the respiratory rate down to from 12 to 15 per minute.

The elimination of acids: The presence of increased acid by-products is evidenced by the following characteristic phenomena—increased respiration, thirst, increased pulse rate. The one great solvent of acid salts is water, and water, therefore, is the medium of acid elimination. In peritonitis not only is the natural intake of water decreased, but through vomiting and sweating the elimination of water is abnormally increased. Therefore, in an acute case in an otherwise normal adult 2,000 milliliters of normal saline solution is given subcutaneously daily, and in addition a 5 per cent solution of sodium bicarbonate and glucose is given continuously by the Murphy drip. The effect of this forced administration of water, alkalis, and sugar is clear and striking. By these measures the rate of acid elimination and neutralization is increased coincidentally with the diminution of the rate of energy transformation and the consequent diminution in the rate of formation of acid by-products which is accomplished by morphin.

The promotion of sleep: Morphin narcosis is a partial substitute for sleep, but it does not equal sleep in its restorative effect. To take

advantage, therefore, of nature's normal periods of rest and restoration in sleep, it is best to push morphin especially during the night and less during the day.

Thus we assemble the forces of control and the forces of restoration. The lesions of infection are becoming better known, the physical processes may be visualized, and consequently our control of peritonitis has increased greatly, and the death rate from peritonitis has been strikingly diminished.—(A. M. F.)

FLINT, J. M. **Localization and extraction of projectiles and shell fragments.** Ann. Surg., August, 1916.

The article is based on experience in the Hôpital 32 bis Château de Passy, Hôpital Français de New York, Fondation Fitzgerald.

As regards the question of removal of these foreign bodies by operation certain indications and contraindications are given, which are quoted verbatim.

Indications.—1. Instances where the projectile or fragment forms a focus of suppuration which will probably continue until either the fragment is removed or until it is discharged spontaneously from a fistula.

2. Instances where the foreign body is causing pain. This may be situated either in the muscles, near bones or nerves, in tendons, or even superficially. Not infrequently the pain may be due to the cicatrix surrounding the fragment rather than to the fragment itself.

3. Instances where the wounds of entrance or exit have healed, leaving the projectile in the tissues surrounded by a small abscess or focus of infection encapsulated from the surrounding tissues.

4. Any interference with the function of the tissues or organs forms a rational indication for a removal of the offending foreign body.

5. Instances where the presence of the foreign body may influence the mental condition of a patient to a degree which justifies its removal.

6. Another group of cases which are of great importance in military surgery belong to the malingering type, that is to say, wounded who claim that small shell fragments or projectiles are painful in order to avoid the responsibility of further military service. In cases of this group it is often difficult or impossible for the surgeon to determine the truthfulness or falsity of the patient's statement. The author has seen repeatedly cases where he was convinced that the pain would cease on the day of the declaration of peace. Such instances, however, require extraction in order to restore the wounded man to active service.

7. Cases where a lead projectile may give rise to lead poisoning. There have been, apparently, a few well authenticated cases of this type.

8. When cases are brought in fresh from the front and operations are performed for infections, better drainage, removal of loose bone fragments in compound fractures, etc., the projectiles should be removed, if possible.

Contraindications.—1. No operation should be performed which does more injury to the tissues than the presence of the foreign body.

2. The operations should not be performed in clean cases where there is not a reasonable expectation of aseptic healing or a great probability of finding the projectile.

The different methods of localization of foreign bodies are described and discussed.

Roentgenography as a localizing method.—Plates are useful only in determining the presence or absence of the foreign body, but not in localizing it; in this regard are superior to the fluoroscope.

The author states he has had no experience with the Mackenzie-Davidson method, but understood from others that such proved inaccurate, due in part to the elasticity of the skin.

Operations directly under the fluoroscopic screen.—This was tried and abandoned, due to difficulty of maintaining asepsis and the fact that important structures could not be differentiated from the surrounding tissues. Such operations can be performed in the extremities, but not in neck, chest, or abdomen. On account of more practical and accurate systems, the same view is taken even where operations are performed under a red light and the screen used intermittently to control the search.

The ring compass.—This is a compass shaped like a pelvimeter, with two rings on the ends about 15 millimeters in diameter. Under the fluoroscope the foreign body is found and centered between the rings; then marks are made on the skin through the rings, which are held in position while the fluoroscope is removed. The part is then moved through an angle of 90 degrees and the process repeated. This gives four points on skin, and the foreign body is at the intersection of the lines connecting same, but the exact depth of foreign body is a matter of approximate conjecture.

The Irvin profondometer.—This consists of a band of malleable metal, as tin, lead, or aluminum, with a hinge in the middle. It can be molded to any part of the body and removed without distortion. The ring compass is used as outlined, but the number of observations made are increased to four, sometimes six or eight. Small stamps with numbers or letters are used to make the marks on the skin so there will be no confusion. The profondometer is then applied and marked like the skin. It is then removed and placed

on a sheet of paper and the intersecting lines drawn. When applied to a tracing of a cross section of the part taken from a good cross-section anatomy the exact location of the foreign body can be determined and operation planned accordingly. A full description of this method is given with explanatory drawings.

The Sutton localizer.—This is an excellent method and well adapted for use in the extremities. It can not be used in neck, chest, or abdomen for fear of injuring important structures. As originally described by Sutton, a trochar and cannula are passed, under aseptic precautions and local anesthesia, by the aid of the fluoroscope down to the foreign body. The trochar is withdrawn and a fine steel wire with a crook on end is passed through cannula to the object and cannula withdrawn. The wire marks the foreign body, and patient can be transferred to operating room for operation.

The author has modified this by using a blunt obturator after piercing the skin with the pointed trochar, and after the foreign body is located a harpoon-pointed obturator is used and left in position instead of the fine wire. He also primarily uses the profondometer for localization before passing the trochar and cannula.

The vibrating magnet of Bergonié.—This is a powerful magnet used with a current interrupted several hundred times a minute and this causes magnetizable foreign bodies to dance in the tissues, and consequently easily palpable. While excellent for magnetizable objects, it has no effect on copper or lead, and consequently its use is limited. It is also useless for the magnetizable objects situated in bone or covered by dense fibrous tissues. It has been very useful in cases fresh from the front in which operation is indicated on account of fractures or infection and the use of profondometer too painful.

In considering each of the several methods given, all have their drawbacks and no one method is suitable for all cases. A combination of methods is at times necessary, depending on the part of body involved.

In general the procedure at the Hôpital 32 bis was as follows:

1. Roentgenography for record and the determination of the presence or absence of very small fragments.

2. Compass localization.

3. The use of the profondometer for the determination of the depth of the projectile or fragment from the skin incision as well as its relation to important anatomical structures.

4. The use of the Sutton localizer with the harpoon guide in suitable cases.

5. An effort was made to employ the Bergonié magnet in recent cases, but this frequently failed from the lack of a current of suffi-

cient strength to operate it effectively. In many instances the shell fragments or projectiles were found in course of the routine operations by digital search alone, aided by simple roentgenograms.

With the methods outlined marked success was obtained and projectiles removed in every case considered necessary "with minimum of trauma to the tissues and maximum of safety to the patient." Eighty per cent of extractions were done under local anesthesia.

Twenty-three interesting cases are described, giving the method or methods used and operation in each case, with comments on same.—(E. H. H. O.)

HYGIENE AND SANITATION.

C. N. Fiske, Surgeon, and R. C. Ransdell, Passed Assistant Surgeon, United States Navy.

Zingher, A. The Schick reaction and its applications. New York State Jour. Med., March, 1916.

The definite association between the presence of antitoxin in the blood and immunity to diphtheria has been firmly established on the one hand by the efficiency of passive immunizing doses of antitoxin in protecting individuals against diphtheria, and, on the other hand, by finding a complete absence of antitoxin in those who develop clinical diphtheria.

The presence of natural immunity in a large number of people is a well-established clinical fact—this immunity is definitely associated with the presence of natural antitoxin, as shown by finding it in measurable quantities in the blood of such immune individuals. The determination of the presence of antitoxin by the older methods is difficult and expensive and requires the use of guinea-pigs. Schick has recently published a simple clinical test by which we can easily determine the presence of antitoxic immunity.

This test depends on the local irritant action of minute quantities of diphtheria toxin when injected intracutaneously. If antitoxin is absent, or if present only in such small amounts as to be insufficient for protection, a positive reaction will appear in 24 to 48 hours. This reaction is characterized by a circumscribed area of redness and slight infiltration which measures from 1 to 2.5 cm. in diameter. It persists for 7 to 10 days, and on fading shows superficial scaling and a persistent brown pigmentation. The amount of toxin injected, as advised by Schick, is 1/50 m.l.d. for the guinea-pig in 0.1 mil of normal saline. We prefer 1/50 m.l.d. in 0.2 mil on account of fairly severe local reactions seen occasionally with the greater concentration of the toxin in those individuals who have not even a trace of antitoxin. The injection is quite painless, except for a slight temporary burning sensation.

It is important to distinguish the true reaction from a pseudoreaction which is found in a small percentage of older children but in a larger percentage of adults, who may or may not have antitoxin. These reactions are probably local sensitization phenomena of a protein character, since similar reactions can be obtained with toxin heated to 75 C. for five minutes or with dilutions of the autolyzed substance of the diphtheria bacillus in which no toxin is present. The pseudoreaction can be distinguished clinically in most cases from the true reaction. It appears earlier, is more infiltrated, less sharply circumscribed, owing to a secondary areola around it, and disappears in 24 to 48 hours. It leaves only a faintly pigmented area, which, in our experience, never shows superficial scaling. Occasionally we see a combined reaction which represents both a true and a false reaction. In such cases we should obtain the evidence of a positive reaction after the pseudoreaction disappears.

For the carrying out of the test it is essential to have an accurate syringe with a sharp but short-pointed, fine needle. The usual 1 mil record tuberculin syringe, with a fine platinum-iridium needle, answers the purpose well. A standard diphtheria toxin is diluted at first 1.1 in 0.5 per cent phenol; this dilution will keep in the ice box with little deterioration for at least two weeks. For use, further fresh dilutions are made in normal saline of such strength that 0.2 mil contains 1/50 m.l.d. for the guinea-pig. This amount is injected intracutaneously on the flexor surface of the arm or forearm. If the injection has been made properly a definite circumscribed whitish elevation, similar to a wheal, will appear, which persists for several minutes. The size of the wheal can be used to gage the amount of diluted toxin injected. The persistent pigmentation may make the forearm objectionable; in such cases the surface of the arm may be chosen.

Though the intensity of the reaction varies in different individuals, a well-marked redness indicates an almost complete absence of antitoxin. Faint reactions point to the presence of very small amounts of antitoxin, which are not sufficient, however, to protect certainly the individual against diphtheria. To prevent the appearance of the reaction, according to Schick, at least 1/30 unit of antitoxin per mil of blood is required. This amount he considers sufficient to protect against diphtheria. According to von Behring, even as little as 1/100 unit of antitoxin will protect against the disease in uncomplicated cases.

The author summarizes the applications of the test as follows:

(1) The absolute reliability of the test in showing the presence or absence of antitoxic immunity to diphtheria, a negative reaction indicating that the individual is protected probably indefinitely against the disease.

(2) In determining the efficiency of the active immunization of susceptible individuals who have been injected with a mixture of diphtheria toxin and antitoxin.

(3) To clear up the diagnosis of clinically doubtful cases of diphtheria.

(4) The Schick reaction has added further experimental proof to the clinical experience that very toxic cases of diphtheria require the early intravenous administration of large doses of antitoxin.

(5) The results obtained with the Schick test in families seem to indicate that besides infection with virulent diphtheria bacilli, other factors, possibly hereditary in nature, are concerned in the production of natural immunity to diphtheria. The absence of antitoxin immunity in more than 65 per cent of individuals after an attack of diphtheria or after treatment with mixtures of toxin and antitoxin shows that the tissues have never had or have never acquired the ability to produce antitoxin.

(6) After an attack of diphtheria, the Schick test may be used to determine whether the individual has become immune to a second attack of the disease.

(7) The use of the Schick test in carriers of diphtheria bacilli will be of service in showing the necessity of using antitoxin to protect those who react positively, and who are to be operated upon for nose or throat conditions.

(8) During an epidemic of diphtheria in an institution we may use the Schick test to advantage in controlling the spread of the disease. All inmates should be tested and only the positively reacting cases immunized with antitoxin.

(9) In contagious-disease hospitals the Schick test has a distinct value as a routine procedure at the time of admission in cases of scarlet fever and measles. If they react negatively they need no further immunization against diphtheria.

(10) In many general hospitals the custom of giving every child on admission a passively immunizing dose of antitoxin might be replaced with advantage by using the Schick test and only injecting the positively reacting patients.

(11) In private practice, the use of the Schick test will save from immunizing a large proportion of the adult members and many of the children of the family.—(J. A. RANDALL.)

PARK, W. H., and ZINGHER, A. **Diphtheria immunity—natural, active, and passive. Its determination by the Schick test.** Am. Jour. Pub. Health, vi, No. 5, May, 1916.

The authors emphasize in concluding the report of their investigations the following:

(1) The great reliability of the Schick test, when the toxin is of proper strength and the method of employing it is correct, in show-

ing the presence or absence of antitoxic immunity to diphtheria. A negative reaction obtained after the age of two or three years indicates that the individual is protected, probably indefinitely, against the disease. The great majority of positive reactions in children are true reactions and indicate an absence of antitoxin, and, therefore, unless other antibodies are present, a susceptibility to diphtheria. Among the adults the pseudoreaction is seen in a certain proportion of individuals, but this reaction can usually be distinguished clinically from the true reaction. The two reactions may be found in the same individual; in such cases the pseudoreaction will disappear in three to four days leaving a distinct circumscribed area of scaling pigmentation due to the positive reaction. The later injection of some of the same lot of toxin either heated to 75 C. for five minutes or after neutralization with antitoxin as a control will help to indicate the pseudoreactions.

(2) The test has great value in determining clinically the efficiency of the immunization of susceptible individuals who have been injected with mixtures of diphtheria toxin and antitoxin. For this purpose only positive Schick cases should be chosen, and after the injections they should be tested 1, 3, 6, and 12 months later to determine whether a sufficient amount of antitoxin had developed early or late to inhibit the Schick reaction, showing thereby the production of an active immunity to diphtheria.

(3) The Schick test is of great help in clearing up the diagnosis of clinically doubtful cases of diphtheria. With a purulent or sanious nasal discharge showing the Klebs-Loeffler bacillus it is difficult to decide whether the case is a carrier or a beginning diphtheria. A negative reaction excludes diphtheria, while a positive Schick reaction leaves the diagnosis of diphtheria still a probability. A case of tonsillitis due to streptococcus in a carrier of diphtheria bacilli would, by the use of the culture alone, be thought to have diphtheria and in danger of extension of the disease. A negative Schick reaction would indicate the case to be simply a carrier, and in no danger from the effects of the diphtheria poison.

(4) The Schick reaction has added further proof to the clinical and experimental observations that very toxic cases of diphtheria do better when given an early intravenous injection of antitoxin than when it is administered in any other way. It reveals the fact that an intravenous injection of antitoxin is able to partly neutralize toxin six hours after its absorption by the tissues and thus gives us hope in some of the late cases of diphtheria. The results with the Schick test will serve as a reminder that after contact with the tissues for more than a few hours the effect of the toxin can no longer be prevented; that a day and, in fact, hours of delay in the administration of a therapeutic dose of antitoxin may mean not only

the absorption, but the final binding, of a fatal dose of diphtheria toxin.

(5) The results obtained with the Schick test in families seem to indicate that besides infection with virulent diphtheria bacilli, other factors, possibly hereditary in nature, are concerned in the production of natural immunity to diphtheria. The absence of antitoxic immunity in more than 65 per cent of individuals after an attack of diphtheria and in the majority of positive Schick cases within four weeks after treatment with mixtures of toxin and antitoxin shows that the tissues have never had, and have only slowly acquired, the ability to produce antitoxin.

(6) The Schick reaction can be applied with advantage in testing the patients, resident staff, and nurses of contagious-disease hospitals. By its use a considerable saving can be effected in antitoxin during outbreaks of diphtheria in institutions or in homes; it relieves of the fear of contagion and also avoids unnecessarily sensitizing about one-half of the exposed individuals. It should be applied as a routine in both the measles and the scarlet-fever pavilions of hospitals. By administering 1,000 to 2,000 units of antitoxin in positive Schick cases and reimmunizing the patients if they remain for more than three weeks in the hospital, we should be able to control the development of diphtheria during the convalescence from scarlet fever or measles.

(7) The immediate results following the injection of the toxin-antitoxin mixture have been somewhat disappointing, but the later ones are quite encouraging.

"In conclusion, we believe that the good late results following the toxin-antitoxin injections and the ability now to recognize clinically those individuals who are susceptible to diphtheria, will arouse an interest in the more widespread use of an active immunization with mixtures of diphtheria toxin and antitoxin which will enable us to greatly lessen and, perhaps, finally eradicate the disease. Up to the present time, in spite of the use of antitoxin, the number of cases of diphtheria has but slightly diminished. The brilliant lowering of the death rate has been due, as stated by von Behring, to the lessened mortality in the treated cases rather than to a decrease in the total number of cases of diphtheria."—(C. N. F.)

KENDALL, A. I. **The bacillus carrier and the restaurant.** Am. Jour. Pub. Health, vi, No. 7, July, 1916.

Beyond the academic exposition of the subject, the important point in this paper for the naval sanitarian is the fact that while the 225 restaurant employees of a large department store were being examined for the discovery of a typhoid-bacillus carrier, it was found

commercially practicable and bacteriologically efficacious to scrub hands "before entering the space set apart for the restaurant, in the morning, after the noon recess, and after an absence during the day" (visit to toilet).

"The plan adopted consisted first of an explanation in simple terms to the employees of the possibility and mode of infection and the efficiency of soap (containing a moderate amount of a phenol derivative) and the thorough scrubbing of the hands, with the necessary demonstrations; then the enforcement of the hand cleansing under the supervision of a nurse of strong personality." Brushes were kept in a disinfecting solution. After such routine the hands of 60 employees failed to give colon bacilli in 1 milliliter of subsequent scrub water plated on Endo medium, while all 12 of the controls without the preliminary scrubbing yielded colon bacilli in 0.1 milliliter. "One bacillus carrier was detected—a cook convalescent from illness of several weeks' duration reported for duty. The urine, feces, and blood were submitted for examination," and all save the urine were found positive.—(C. N. F.)

KITANO, T. **The employment of rat poison as a measure for preventing and exterminating plague.** Am. Jour. Trop. Dis. and Prev. Med., June, 1916.

The author was in charge of the suppression of the epidemic of 1913–14 in Yokohama, and points out his markedly successful results attained in six months, the credit of which he gives to a universal use in *all* houses of rat poison. The logic of this is apparent, but its execution has never hitherto apparently been carried out. The following are his conclusions:

That phosphorus in the preparation of rat poison is the most effective agent.

That arsenic, if the material be changed with the seasons and the taste of rats, is next to phosphorus in efficiency.

That sulphonal and calcium sulphate are not perfect in their effect.

That though the phosphorus and arsenic compounds are both very dangerous to mankind, this can be obviated by care in distribution.

That if plague-ridden rats eat these rat poisons they die so soon that the bacteria can not widely spread.

That the phosphorus stays operative more than 20 days, arsenic even longer.

That the distribution, when compared with other preventive measures, is simple and economical.

That the distribution and placing does not interfere in the least with commercial and industrial enterprises.

That the more widely the poison is distributed to every house the better are the results.

That no rats were found in the localities where rat poisons were distributed to every house therein several times.

That bacteria in the dead body of the rat are destroyed within from 2 to 12 days when the temperature is low, and the body of the rat decays.

That the cleansing and disinfection of the houses is quite needless after the distribution of the rat poison.

That as a means of preventing the plague the employment of rat poison is superior to any other measure—(R. C. R.)

PEASE, H. D. **Some observations on causes of high bacterial counts in market milk.** Am. Jour. Pub. Health, June, 1916.

In parts of the country where adequate field and laboratory supervision of milk supplies have been in operation for a number of years, high bacterial counts are most generally caused through inefficiently cleaned apparatus, and by the incubation of bacteria taking place either on the moist surfaces of cans or other utensils, or that taking place in the product itself due to inefficient refrigeration.

In locations where no supervision has been in operation and where the producers are naturally more or less slovenly, the rather uniform, high bacterial counts found in milk from such farmers may be more or less appropriately attributed to definite dirty conditions. This would be especially true of the instances where the milk can be shown to have been delivered promptly and with the application of a reasonable degree of refrigeration.

The result of the comparisons made between these two groups may be taken as a fair index of the excellent results that have been brought about through the persistent, intelligent application of the methods of official and private milk supervision which have been in operation in most of the large centers of population during the past decade.—(R. C. R.)

TROPICAL MEDICINE.

E. R. STITT, Medical Director, United States Navy.

RITCHIE, T. R. **On agglutination reactions with normal sera.** Lancet, London, June 24, 1916.

The author has made a study of the agglutinating power of the serum of 792 individuals who could be regarded as typically normal. In particular, those who came in contact with infections of the typhoid-dysentery group, as physicians and nurses, were rigidly excluded.

The findings as to the agglutinating power of normal sera for dysentery organisms are very striking in view of the statements of such an authority as Shiga, that the agglutinating titer of the serum of convalescents from Shiga-strain bacillary dysentery is usually not over 1 to 50, and that a reaction of 1 to 20 must be regarded as positive.

With the Shiga strain about 30 per cent gave positive reactions in 1 to 32, and 4.6 per cent gave positive reactions in 1 to 64.

With the Flexner strain about 41 per cent gave positive reactions in 1 to 64, and 30 per cent in 1 to 128 dilutions.

Comparing these titers for dysentery organisms with those obtained for typhoid and the paratyphoids, we have the following results for these latter bacilli.

With the paratyphoid A organism only about 2½ per cent agglutinated in a dilution of 1 to 16, and with paratyphoid B only about 4 per cent of the sera of these normal individuals agglutinated this organism in 1 to 16 dilution.

With the typhoid bacillus only about 6 per cent gave positive agglutination in 1 to 16.—(E. R. S.).

GORDON, T. J., and THOMSON, D. **Memorandum on the prevention of amebic dysentery.** Brit. Med. Jour., June 24, 1916.

There are many valuable practical points in this article. It is noted that efficient treatment prevents patients from becoming cyst carriers and that while doses of one grain of emetin daily for three or four days may benefit the patient, such treatment leads to relapses and tends to produce cyst carriers. At least 7 daily administrations of emetin in 1-grain doses is necessary, and in many cases we should give 10 daily treatments. The omission of the dose on any successive day of the course should be avoided.

In the treatment of cyst carriers at least 10 daily doses of emetin should be given combined with the employment of magnesium sulphate in 2-dram doses two or three times daily. Flies may ingest cysts containing feces and later on deposit such cysts on food in their own feces. Cysts can remain alive for weeks in water containing them, and it is probable that cysts in feces deposited on sandy soil may be transferred to food by such dust being blown about.

The feces of every case of amebic dysentery should be examined microscopically to prove the absence of cysts before such patients are discharged.

The recommendations as to food, latrines, etc., are along the lines of avoiding the transference of cysts containing material by flies, drinking water, or sand blown about.—(E. R. S.)

PATHOLOGY, BACTERIOLOGY, AND ANIMAL PARASITOLOGY.

C. S. BUTLER, Surgeon, and R. H. LANING, Passed Assistant Surgeon, United States Navy.

WILLIAMS, W. W., and BURDICK, W. **Sputum cultures with subsequent complement-fixation control.** Interstate Med. Jour., July, 1916.

In securing specimens, the writers have the patient brush the teeth carefully, without using powder or paste. Next, the mouth is rinsed with 12 changes of sterile water, followed by gargling 6 times with sterile water, and then 6 swallows of sterile water. The mouth is kept closed and a specimen secured after a deep, hard cough. The specimen is collected in a sterile container. It is then washed by a small jet of sterile salt solution until only a small mass of mucoid fibers remains. The material is then spread over freshly made human-blood-agar plates.

If a vaccine is desired the resulting colonies are washed off with normal salt solution containing 0.3 per cent tricresol. The suspension is shaken until homogeneous and placed in the incubator for 24 hours, then tested for sterility. Heat is not used in sterilizing. The solution is then standardized and diluted as required.

Complement-fixation tests are carried out on the patient's serum, using colon bacilli, *M. catarrhalis*, diphtheroid bacilli, Friedländer's bacilli, streptococci, influenza bacilli, etc.

They found that in 90 per cent of the recent cases of "grip," streptococci were isolated.—(G. F. CLARK.)

HOLT-HARRIS, J. E., and TEAGUE, O. **A new culture medium for the isolation of Bacillus typhosus from stools.** Jour. Infect. Dis., June, 1916.

The medium is prepared as follows: Agar, 1.5 per cent; Witte's peptone, 1 per cent; sodium chlorid, 0.5 per cent; Liebig's meat extract, 0.5 per cent, cleared with egg white, placed in flasks, and sterilized in Arnold sterilizer on three successive days. Reaction plus 0.8. The agar is melted; saccharose 0.5 per cent and lactose 0.5 per cent are added. The medium is then heated for 10 minutes in the Arnold. To every 50 milliliters of the medium add 1 milliliter of 2 per cent yellowish eosin and 1 milliliter of 0.5 per cent methylene blue. Agar prevents the formation of a precipitate produced by the combination of eosin and methylene blue, in the proportion used, if in distilled water instead of agar.

After 18 hours' incubation the colonies of typhoid bacilli are colorless and transparent; *B. coli* deep black. The color is not imparted to the surrounding medium as it is in Endo medium.

No inhibition of growth of typhoid bacilli was noted when twice the amount of methylene blue was used, whether alone or in combination with eosin.

Stock solutions of 2 per cent eosin and 0.5 per cent methylene blue, in distilled water, are kept in the dark. They are not sterilized and can be kept in the ice box for weeks without causing contamination. The agar is not heated after the addition of the dyes, although heating in the Arnold for one-half hour is not injurious.—(G. F. CLARK.)

TEAGUE, O., and TRAVIS, W. C. **A new differential culture medium for the cholera vibrio.** Jour. Infect. Dis., June, 1916.

Methylene blue was found to inhibit the growth of cholera vibrios, although agar containing as much as 0.1 per cent eosin did not. Bismarck-brown was found to be less toxic for cholera vibrio than other basic strains.

The medium is prepared as follows: Two pounds of chopped beef are soaked in 2 liters of distilled water in ice box overnight. The fluid is squeezed out, heated in Arnold sterilizer, filtered through filter paper, made neutral to litmus by the addition of sodium hydrate, and again heated. After cooling it is inoculated with *B. coli* and incubated for two or three days. Nutrient agar is then prepared from it by adding 1 per cent Witte's peptone and 0.5 per cent sodium chlorid (percentage of agar not stated, probably 1.5 per cent). Reaction is adjusted to —0.5. Nutrose (0.25 per cent) is added after agar is cleared and filtered. A stock aqueous solution of bluish eosin (3 per cent) is kept in the dark. A 1 per cent solution of Bismarck-brown in water containing 10 per cent alcohol is also kept in stock. Bismarck-brown is not completely soluble to 1 per cent in distilled water alone.

To 50 milliliters of nutrose agar add 1 per cent saccharose, 1 milliliter 3 per cent eosin solution, and 2 milliliters of 1 per cent Bismarck-brown solution. Shake until stains are uniformly distributed and pour plates. Place plates face down for 20 to 30 minutes to remove excess of water, prior to inoculation.

Cholera colonies, after 24 hours' incubation, could readily be selected owing to their having a much darker center than other colonies. Cholera-like vibrios also caused the deeper central staining.

The writers suggest trying out the medium in isolation of vibrios from actual cases of cholera.

The work was done with laboratory cultures.—(G. F. CLARK.)

ROBERTSON, H. E. **Therapeutic possibilities of antitetanus serum.** Am. Jour. Med. Sc., June, 1916.

It is pointed out that tetanus antitoxin is rapidly absorbed into the blood stream, after subcutaneous or intralumbar injection, and that it undergoes destruction and elimination in a few weeks.

Attention is called to the differences between tetanus in laboratory animals and in human beings. In animals there is a local tetanus or "tetanus ascendens." It is not until some hours after local manifestations before involvement of centers lying higher in the cord occurs—the vital centers usually being the last to suffer. In man, however, the first symptom is usually "trismus"; the motor centers, which lie near the most vital centers, are the first to be attacked. From the above, it seems clear that the results obtained in animals, after the administration of antitoxin, can not be used as a measure upon which to judge the exact treatment in human cases.

The author proposes intravenous injection of 3,000 units of antitetanus serum in every case, as soon as symptoms appear. The serum remains in the blood stream for at least a week, long enough to decide the issue. He does feel that subsequent doses will be of benefit, but seems convinced that even one-half of the above dose would be just as efficacious.—(G. F. CLARK.)

HOLMES, W. H. **Remarks on B. welchii in the stools of pellagrins.** Arch. Int. Med., March 15, 1916.

Holmes makes the interesting suggestion of a causal relationship of the *B. welchii* to pellagra. He states the following:

(*a*) *B. welchii* is found in larger numbers than normal in stools of pellagrins.

(*b*) Pellagrins subsist on a diet having large amounts of carbohydrates and very small amounts of protein of animal origin—thus favoring the growth of *B. welchii*.

(*c*) *B. welchii* has been found to produce severe diarrhea in children and adults in the presence of high carbohydrate diet. The diarrhea is relieved by protein diet and buttermilk. The buttermilk is of service because the lactic acid organisms are inimical to the growth of *B. welchii*.

He suggests that pellagra may be due to the formation of a toxin or butyric acid, with subsequent absorption. He does not feel that the facts so far known definitely prove *B. welchii* to be the direct or sole cause of pellagra, but thinks further investigation is desirable.—(G. F. CLARK.)

HOWELL, K. **Observations on the production of antibodies after antityphoid inoculation.** Jour. Infect. Dis., July, 1916.

Agglutinin appeared in two men on the third and fifth days, respectively, after the first inoculation, the highest point being reached in about 60 days; it was present in the serum of patient 2 on the thirteenth day.

Opsonin appeared in 3 days and reached its highest concentration in 10 days in No. 1 and in 20 days in No. 2. In No. 1 opsonin was present on the sixtieth day, and in No. 2 on the one hundred and thirty-fourth day. Observations were then discontinued.

Bacteriolysin was increased on the twenty-first day and in both cases reached the highest point within a week.

Complement fixation was obtained in No. 1 on the fourteenth day and was most marked on the twenty-fifth day. In No. 2 fixation was obtained on the seventeenth day and was most marked from the twenty-ninth to the sixty-third days, after which the power of fixation decreased, and was wholly lost on the one hundred and twenty-fourth day.

There was a slight negative phase after each inoculation.

The severity of the general reaction in patient 1 seemed to have no effect on antibody-production.

After injection of typhoid vaccine into human beings specific antibodies develop in the blood. They reach the highest concentration in from one to two months, after which they gradually diminish. Opsonin appears to develop earliest. Agglutinin, so far as known now, persists the longest, having been demonstrated to be present two years and even longer after the vaccination. Specific complement fixation is obtainable with the sera of persons injected with typhoid vaccine, hence this test is not distinctive of typhoid fever.—(R. H. L.)

Kolmer, J. A., and Moshage, E. L. **A study of various methods for determining the virulence of diphtheria bacilli. A study of acid production by diphtheria bacilli. The relation of the carbohydrate-splitting ferments to the soluble toxins of diphtheria bacilli.** Jour. Infect. Dis., July, 1916.

In the first of this trio of articles the authors give the details in a series of experiments on guinea-pigs of the following methods of determining the virulence of diphtheria bacilli of the granular, barred, and solid types: (1) Subcutaneous injection of 72-hour plain dextrose-broth cultures; (2) the intracutaneous injection of the same; (3) the subcutaneous injection of 72-hour serum dextrose-broth cultures; (4) the injection of 9-day plain dextrose-broth cultures; (5) the intraperitoneal injection of 24-hour plain dextrose-broth cultures; and (8) the subcutaneous injection of salt solution suspensions of 24-hour Loeffler cultures.

The conclusions reached from experiments are as follows: The intracutaneous injection of 0.1 milliliter of 72-hour plain dextrose-broth cultures of diphtheria bacilli proved inferior to the subcutaneous injection of the same cultures in guinea-pigs weighing from 250 to 300 grams in dose corresponding to 0.5 per cent of the body

weight expressed in milliliters. The former method yielded 64.9 per cent positive results, as compared with 86.5 per cent with the latter method.

It is more difficult to read and interpret the results with the intracutaneous method than with the subcutaneous method.

Of all methods employed that of subcutaneous injections of suspensions of 24-hour Loeffler cultures in normal salt solutions yielded the best results. This method yielded 69.6 per cent positive results, as compared with 61.5 per cent positive results with the subcutaneous injection of 72-hour plain dextrose cultures.

The subcutaneous injection of plain 72-hour serum-broth cultures yielded the same percentage (62.5) of positive reactions as the subcutaneous injections of 24-hour Loeffler cultures, but the latter is a superior method, as it consumes less time, while being just as positive in its results.

Twenty-four-hour Loeffler cultures in subcutaneous injection yielded the same results as 9-day plain dextrose-broth cultures.

Serum dextrose-broth cultures yielded a higher percentage of positive results (75 per cent) than did plain dextrose-broth cultures (50 per cent) when both were cultivated for the same length of time and injected subcutaneously in equal dosage.

The subcutaneous injection of 72-hour plain dextrose-broth cultures proved superior to the intraperitoneal injection of 24-hour and 72-hour plain dextrose-broth cultures. With serum dextrose-broth cultures, however, the intraperitoneal injection of 24-hour growths was equal, if not slightly superior, to the subcutaneous injection of 72-hour cultures.

From the standpoint of delicacy and of time required, the subcutaneous injection of 24-hour Loeffler cultures after the method described yielded the best results.

The subcutaneous injection of 72-hour serum dextrose-broth cultures yielded equally good results, but this method requires more time for the conduct of a virulence test; likewise the intraperitoneal injection of 24-hour serum dextrose-broth cultures yielded good results, but this method is less to be preferred than subcutaneous inoculation, because with the latter local inflammatory changes are more easily detected.

As it has been claimed that acid production by various types of diphtheria bacilli in different sugar media is an important means of distinguishing the various types and also in distinguishing the virulent from the avirulent forms, the authors in their second article have studied a number of cultures from various sources, the object being (1) to note the acid production with various carbohydrates by cultures of diphtheria bacilli from various sources, of vary-

ing morphology, and of known virulence as determined by animal inoculation tests, and (2) to ascertain the practical value of these tests in aiding differentiation among the members of the diphtheria group. The authors state with regard to the practical value of acid-production tests that:

"In our experience acid-production tests are of limited value in the classification of diphtheria bacilli. The difficulty of securing pure carbohydrates for these tests constitutes a disturbing factor which may account in part for the irregularities and inconstant results. From a practical standpoint these tests have generally proved successful in the identification and classification of the Hoffmann bacillus on the basis that it does not produce appreciable quantities of acid with carbohydrates. For the purpose of differentiating between virulent and nonvirulent bacilli, these tests have failed to prove of any value; the typical virulent diphtheria bacillus produces acids most characteristically with dextrose, dextrin, levulose, and galactose, and the false types, or Hoffmann bacilli, produce no acids at all; but between these extremes is a large group of bacilli of varying morphology and from different sources which present varying and inconstant degrees of virulence and fermentative power.

"Considerable interest is attached to cultures of diphtheria-like bacilli from the conjunctivæ. Such bacilli from the normal eye, which are practically always nonvirulent, are well known under the name of *B. xerosis*. These micro-organisms are capable of fermenting saccharose, and we have found them capable of attacking other sugars as well, including dextrin and dextrose; as previously stated, we have not found the fermentation of saccharose and absence of fermentation of dextrin by these bacilli sufficient to differentiate *B. xerosis* from the true diphtheria."

The author's conclusions are as follows:

"Acid production of diphtheria bacilli in Hiss' serum-water-carbohydrate media is most marked with dextrose, dextrin, levulose, and galactose.

"A small percentage of cultures from the throat and nose also produce acid with saccharose.

"Nonvirulent diphtheria-like bacilli from the conjunctivæ are capable of fermenting not only saccharose but also other sugars as well, including dextrin and dextrose.

"Granular types of bacilli generally produce acids more frequently than do the solid types, and long solid types more frequently than do the short varieties.

"In general, the time of appearance and degree of acid production from carbohydrates are somewhat parallel with the degree of virulence of the diphtheria bacilli.

"Acid-production tests on different carbohydrates are not sufficiently regular to be depended on in determining the harmfulness of a given culture.

"Acid-production tests are of most value in the study and classification of the solid varieties of the diphtheria-like bacilli; cultures proving nonvirulent for guinea-pigs and producing no acid with sugars are classified as the pseudo or Hoffmann's types; nonvirulent cultures producing acid with one or more sugars are regarded as nonvirulent diphtheria bacilli."

In the third of this trio of articles the authors show by experiments that carbohydrate fermentation of diphtheria bacilli is dependent on secretory enzymic products of the diphtheria bacillus, but is independent of the soluble poison or toxin; these ferment-like carbohydrate-splitting products are most likely to be produced by toxin-producing bacilli.—(R. H. L.)

CHEMISTRY AND PHARMACY.

E. W. Brown, Passed Assistant Surgeon, and O. G. Ruge, Chief Pharmacist, United States Navy.

Givens, W. H. **Modification of Rose's method for the estimation of pepsin.** Am. Jour. Pharm., 1915, 87, 541.

Rose's method required the digestion of 0.25 per cent solution of pea globulin in 10 per cent sodium chlorid at 37 C. for 15 minutes with varying amounts of a previously neutralized gastric juice, usually diluted five times. Although the gastric juice is thus first neutralized, the digestion is made to take place in dilute hydrochloric acid of standard strength, so that, as Rose claims, the conditions are constant in every trial in respect to acidity, volume, protein content, and temperature. The author objects to this preliminary neutralization of pepsin, since very dilute alkalis will inhibit, if not destroy, the action of pepsin. In order to avoid neutralization and consequent destruction of gastric juice, the following procedure is recommended. The gastric contents are strained through cheesecloth, the filtrate is diluted twelve and a half times and into each of seven small test-tubes is measured 1 milliliter of a 0.25 per cent solution of filtered pea globulin in 10 per cent sodium chlorid solution. To each tube is added 1 milliliter of 0.6 per cent hydrochloric acid. The tubes are then allowed to stand about 5 minutes until the maximum turbidity develops. To the first five tubes distilled water is added, as follows: To the first, 0.9 milliliter; to the second, 0.8 milliliter; to the third, 0.7 milliliter; to the fourth, 0.6 milliliter; to the fifth, 0.5 milliliter; to the sixth and seventh, none. The following amounts of the diluted gastric juice are then added: To the first, 0.1 milliliter; to the second, 0.2 milliliter; to the third, 0.3 milliliter; to the fourth, 0.5 milliliter; to the fifth, 0.8 milliliter; to the sixth, 1 milliliter; and to the seventh,

1 milliliter of the diluted boiled juice. All tubes are then immersed for 15 minutes in a water bath at 50 to 52 C. At the end of this time the tube is selected which is clear and contains the least amount of diluted gastric juice. Upon this basis the peptic acidity is calculated as the number of milliliters of 0.25 per cent globulin digested by 1 milliliter of undiluted gastric juice. If the original free acidity of the gastric juice be high, a dilution of twenty-five times instead of twelve and a half may be used. The gastric contents are never filtered, but strained through cheesecloth, as it is believed that in this way less enzyme is absorbed.—(E. W. B.)

JONA, J. L. **Experimental study of fever.** Jour. Hyg., London, 1916, xv, 169–194.

A definite rise of body temperature occurs in rabbits after injecting a minute amount (0.000004 gram) of cultures of *Bacillus coli communis* or *B. typhosus* in Ringer's solution. Larger doses cause collapse and even death. The substances to which this is due are soluble in water and saline solutions, insoluble in ether and in alcohol. Their potency is lessened by contact with alcohol. They may be separated from the solutions by filtering through a collodion filter. They are therefore colloidal or adherent to colloid materials. They are not destroyed by boiling or by dry heat at 110 C. The fever lasts a few hours, and is due to diminution in the loss of heat; heat production is unaffected or may be increased. The fall of temperature in collapse is accompanied by disease of both production and loss of heat. In animals in which the brain stalk has been severed distal to the optic thalamus, no fever was caused after the injection of the ordinary pyretic dose.—(E. W. B.)

BERINGER, G. M. **Some of the changes made in the Ninth Decennial Revision of the United States Pharmacopeia.** Am. Jour. Pharm., August, 1916.

While there has been much delay in getting out this revision, so many new features were given consideration and finally adopted that the time of the revisers was no doubt fully occupied in considering all the questions involved with a view of rendering a final decision only after mature judgment could be formed and a consensus of opinion obtained.

The scope of the Ninth Revision is indicated by the following:

"The consensus of opinion of the committee was, in effect, to provide standards for vegetable drugs, chemical substances, and such pharmaceutical preparations as were simple in their character and most largely used. A few compound preparations, however, were retained because of their large use; an increase has been made in the number of standardized serums and animal products. A number of synthetic remedies have been added to the list which the sub-

committee on scope had recommended for admission, permission having been granted by the manufacturer, firm, or corporation to include such substances; unfortunately, the European war has interfered with the receipt of some answers from foreign countries. In most cases where answers were received the replies were in the negative."

In regard to number of admissions and deletions: "The number of articles, reagents, and assays in the present Pharmacopeia is 1,436; there were 1,297 in the previous Pharmacopeia. In the present book there are 782 articles in the text; 277 test solutions and volumetric solutions; 315 volumetric, gravimetric, and other assays, and 62 diagnostical reagents. In the U. S. P. VIII there were 958 articles in the text, 155 test solutions and volumetric solutions, 149 volumetric assays, and 35 gravimetric assays. Of those articles official in the text of the U. S. P. VIII, 243 have been dismissed, while 67 new ones have been introduced into the U. S. P. IX."

One of the changes that has attracted much attention is the adoption of the word "milliliter" in the place of "cubic centimeter" and the word "mil" in place of "c. c."

"The United States Bureau of Standards declared that the term cubic centimeter was a misnomer, there being a slight difference between the thousandth part of a liter and the cubic centimeter, as 1 liter was determined to be the equivalent of 1.000027 cubic decimeters. The committee of revision decided that the time had come to adopt the word mil, the first three letters of the whole word milliliter. In addition, the change promotes international uniformity in the two Pharmacopeias published in the English language."

A noticeable improvement is seen in the pharmacognostic descriptions. Here we have not only the microscopic appearance and structure of the drug described, but also descriptions of the powdered drug under the microscope. The purity rubric has been extended to the organic drugs, and these monographs commonly give the percentage of allowable admixtures of other parts of the drug plants or other foreign matters. In the organic drugs and their preparations that permit of chemical assaying, limitations are likewise fixed for the variability naturally existing in the drugs and the personal equation or error introduced in the assay processes, and in each case the alkaloidal percentage is fixed by an upper and lower limit.

For the first time in the history of pharmacopeial revision, the methods for the biological assaying of drug products have been recognized. Chapter 23, in part 2, is devoted to this subject, and official processes are described by which the following drugs and their preparations may be assayed: Aconite, digitalis, strophanthus, squills, dried suprarenals, and cannabis must be assayed by the official biological process. The standard adopted for the latter drug

is that "Cannabis made into a fluidextract, in which 100 mils represent 100 grams of the drug when assayed biologically, produces incoordination when administered to dogs in a dose of not more than 0.03 mil of fluidextract per kilogram of weight."

The list of powdered extracts has been greatly extended, and in several instances formulas for both the pilular extract and the powdered extract of the same drug are very properly given. The instructions of the pharmacopeial convention to adopt general formulas wherever possible has been partially carried out by the introduction of general instructions in the aromatic waters, and by general formulas and classifications in the fluid extracts and tinctures.

Two hundred and forty-two titles have been dismissed from the Pharmacopeia; 38 of these were fluid extracts, 7 were pills, and 10 were tinctures. A majority of these preparations have been included in the Revised National Formulary, and so the National Formulary will relatively become more important because of these deletions from the Pharmacopeia.

Synonymy has not been treated through the Index as in the Eighth Revision, but following each Latin title will be the official English title and the more commonly used synonyms. In addition to this, there will be the official abbreviation printed in heavy type, with the hope that physicians will adopt these official abbreviations in prescription writing, so that there will be an official authority for the abbreviations for the official titles commonly used in prescriptions.

NOTE.—The Ninth Decennial Revision of the United States Pharmacopeia becomes effective from September 1, 1916, and copies of the new Pharmacopeia will be issued from the supply depots hereafter.—(O. G. R.)

EYE, EAR, NOSE, AND THROAT.

E. J. GROW, Surgeon, and G. B. TRIBLE, Passed Assistant Surgeon, United States Navy.

WHEELOCK, K. K. **The blood-clot dressing in simple mastoid abscess.** Jour. Indiana Med. Assn., ix, No. 6.

Thirteen cases were reported in which the coagulated blood was used to fill the exenterated spaces of the cells. The total hospital detention in these cases was ninety days, or an average of approximately seven days to a case. To render this method successful, every bit of softened bone must be removed and the soft parts thoroughly cleansed.—(G. B. T.)

TOMLIN, W. S. **Chronic suppurative ethmoiditis.** Jour. Indiana Med. Assn., ix, No. 6.

Suppurative ethmoiditis is the cause of many nasal discharges and its course depends to a great extent upon the bacteriology and pathology of the individual case. Extension of the ethmoid cells beyond

the capsule tends to continue the disease. Transillumination, while it gives some information is not so reliable as skiagrams, especially stereoscopic plates. Pain is a varying factor, often absent locally, and at other times intense.

The treatment is surgical, with the intranasal operation the one of choice when the condition is confined to the ethmoid, with no cells abnormally placed. In essentially chronic cases complicated by frontal sinus involvement, a Kilian or one of its modifications is preferable. Local anesthesia for the intranasal operation is preferable, except for children under 12 years of age.

Great care in after-treatment is needed, cleansing daily with large cotton pledgets moist with a 10 to 25 per cent argyrol or 10 per cent ichthyol in water or glycerin, and followed by a mild aseptic oil vapor.

Granulations should be touched by silver nitrate solution, 2 to 10 per cent.

Vaccines, in the author's opinion, have not given the satisfaction expected of them, and without operation he has seen no benefit from their use.—(G. B. T.)

LEOPOLD, S. **Circumscribed purulent leptomeningitis due to frontal sinusitis.** Jour. Am. Med. Assn., lxvi, No. 22.

This may occur with or without brain abscess, may be in association with pachymeningitis, or with an extradural abscess. The convexity of one or both frontal lobes is involved, and there are present symptoms of sinus disease plus meningitis.

The route of infection may be direct through a necrotic wall or indirect through the venae perforantes of the sinus and orbit or by the lymphatics.

Recovery is unusual in the reported cases.—(G. B. T.)

DELEVAN, D. B. **Radium in the field of laryngology.** Med. Rec., New York, xc, No. 2.

While the results of radium treatment have not been uniform, the author is of the opinion that with a clearer knowledge of control of the radiations and the amount of radium to be used as well as the correct duration of the exposures, greater success may be expected in carcinomas. Even in cases ultimately unsuccessful the added comfort renders its use justifiable.

Other conditions reported as having been benefited or cured by radium, are the various nonmalignant growths of the nose and throat, including rhinoscleroma.—(G. B. T.)

REPORTS.

TOPOGRAPHICAL EXTRACTS FROM ANNUAL SANITARY REPORTS.

MONROVIA, LIBERIA; FREETOWN, SIERRA LEONE.

By W. L. Irvine, Passed Assistant Surgeon, United States Navy.

Monrovia, the capital and principal seaport of Liberia, is situated in 6° 19′ north latitude and 10° 50′ west longitude. It consists of two sections: The civilized quarter, inhabited by a few hundred Americo-Liberians and a few European merchants, etc., is built on the top of the plateau of Cape Mesurado, which rises to the altitude of about 290 feet above sea level. The extremity of this plateau drops off in a sheer cliff into the sea, and on the highest point is located Mamba Point Lighthouse. The second division of the city is the native Kru quarter. It consists of a large collection of thatched huts built along the water front from a point near Mamba Point back along Mesurado Lagoon. This lagoon, which is really the harbor of Monrovia, communicates with the sea by a narrow channel across a sand bar. It can be entered by surfboats only. Occasionally the bar is quite dangerous, boats swamping and the occupants drowning. During the last few months a small sand spit has built out from the beach at the foot of Mamba Point, forming a small protected inlet, within which it was possible to land liberty parties. However, this spit is constantly shifting, and in another few months may disappear. Ships have to anchor out in the open sea, where, owing to shallow water, currents, and tides, they roll incessantly. Anchorage at a distance of 1 mile from shore and noncommunication with the beach at night were found to be a sufficient protection against mosquitoes and malaria. The population of Monrovia is variously estimated at from 6,000 to 10,000.

Climate.—The climate of Monrovia is essentially equatorial. There is a dry season between November and April, when the vegetation becomes somewhat parched and the nights cool. The middle of the rainy season is regarded as the coolest time of the year, although the lowest temperatures are recorded between December and March. The highest day temperature seldom goes above 89°, and at night-

time below 74°. The temperature, though never excessively high is nearly always associated with a relatively high humidity, which

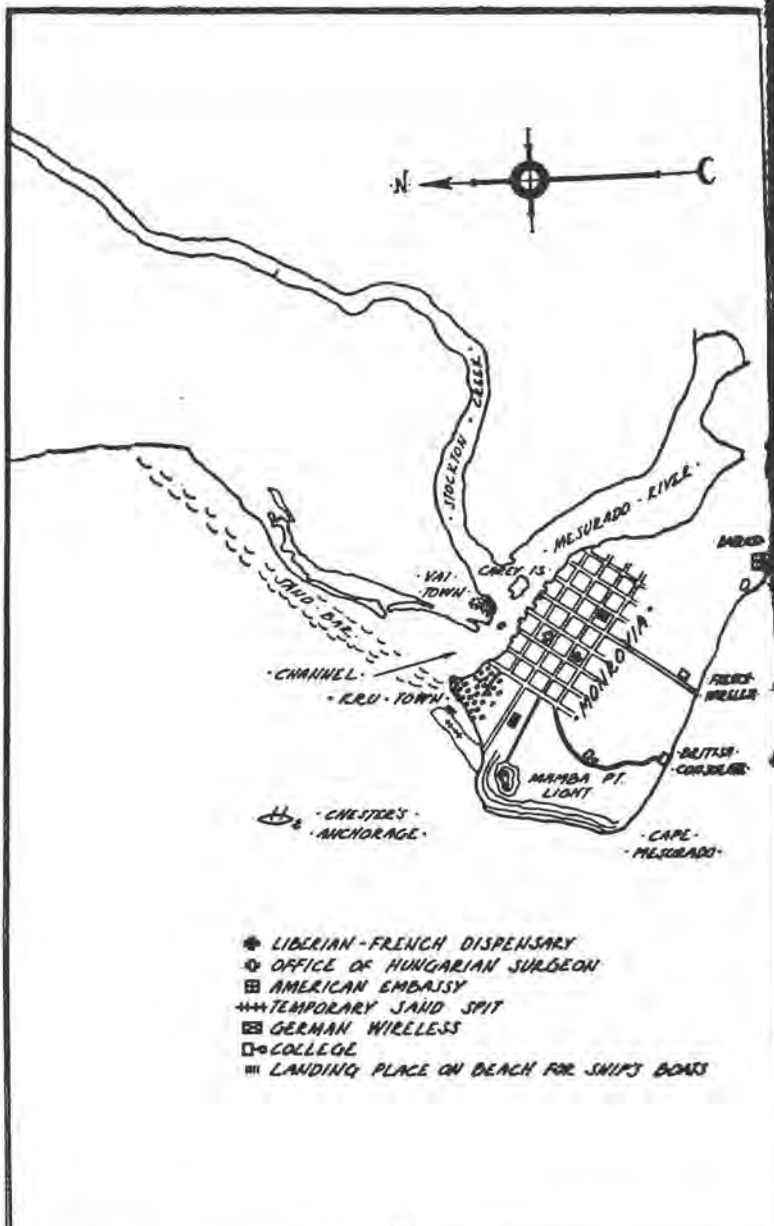


Chart of Monrovia.

retards evaporation from the skin and makes the individual scious of oppressive heat. During about eight months of the

moderate sea breeze blows from the south. During December, January, and February the wind is from the north. This wind is called the "harmattan." It blows from the Sahara Desert and hence is of a drier character and at times laden with fine desert sand. While it blows the inhabitants complain of dryness of the mucous membranes, and affections of the respiratory tract and pneumonia are more prevalent. The annual rainfall amounts to about 153 inches. For about nine months of the year the tendency is toward excessive humidity. The following table gives the wind, temperature, and barometer readings at noon on the days of the *Chester's* stay at Monrovia:

Date.	Wind direction.	Temperature.		Barometer.
		Dry bulb.	Wet bulb.	
1912.				*Inches.*
Nov. 9	Northwest	82	79	29.98
Nov. 27	do	81	80	30.02
Nov. 28	Calm	83	79	29.99
Nov. 29	East	82	80	29.99
Nov. 30	South-southwest	86	82	29.98
Dec. 1	West	81	81	29.97
Dec. 2	do	81	81	30.00
Dec. 3	Southwest	89	84	30.01
Dec. 5	Northwest	81	78	29.98
Dec. 6	Northeast	86	81	29.97
Dec. 15	North-northwest	83	78	29.96
Dec. 16	Southeast	80	77	29.99

The most unhealthy months of the year seem to be September and October, no doubt due to the fact that this is the end of the wet season. For the white population the climate is very enervating and debilitating, so much so that in Sierra Leone, adjacent to Liberia and with a similar climate, the whites of the colonial and military services are required to spend but one year on duty in the colony, followed by a furlough at home of four months for the colonial and six months for the military.

Medical topography.—The character of the immediate surrounding country is low, but about 10 miles inland it becomes hilly and picturesque and covered with dense virgin forest. Mesurado River and Stockton Creek flow into Mesurado Lagoon. Four miles to the north is the mouth of the St. Paul River, the approximate length of which is about 280 miles. These are streams of moderately rapid current, especially during the rainy season. The natural site of Monrovia on a moderatly elevated peninsula, easily drained in two directions and almost devoid of marshes, would make possible a tolerably healthy city. The rock formation is laterite. During its process of disintegration it forms a red surface soil. No diseases other than ancylostomiasis are attributable to the conditions of the soil or geographical formation.

Water supply.—The source of water supply is surface wells, springs, and streams. A very few cisterns in which is stored rain water exist. No measures to prevent contamination of the water supply are employed and sources of pollution are many. All water is generally considered unsafe until boiled or filtered. Toward the end of the dry season the supply becomes very low. The city possesses no facilities for water analysis. Despite the poor water supply very little typhoid exists, but dysentery and diarrheal diseases are somewhat prevalent.

Drainage and sewerage.—No sewerage system exists. The natural slope of the land provides fairly good drainage and a few gutters have been dug. The streets are wide but rough, unimproved, and in many places overgrown with vegetation. Very little attempt is made to keep yards clear of vegetation or refuse heaps. Piles of empty bottles frequently meet the eye. Pigs roam about in the streets. A few privies exist. Along the Kru quarters the beach is foul to the nose and eye with human excreta. Swimming parties should avoid this part of the beach. Street illumination does not exist. Houses are lighted by kerosene.

Food supply.—With the exception of coarse, native varieties, food is scarce and very expensive. Ships on duty here must go to Freetown, Sierra Leone, for provisions. Ice may sometimes be obtained in small quantities. There are no hotels.

Hospitals.—There are no hospitals. The French Colonial Service maintains a small dispensary, the Liberian-French Dispensary. Docteur Jourdran, Medecin Principal des Troupes Coloniales, Inspecteur General de l'Hygiene, is in charge. He does considerable contract work and private practice. This dispensary possesses a small X-ray outfit which was out of commission owing to trouble with the gasoline motor. A medical officer of the Hungarian army, Dr. Fuszek, is also engaged in the practice of medicine. There is one native physician, Dr. Payne, a graduate of a medical school in the United States. At present he holds a governmental position and does very little practice. Plans for a hospital have been under consideration but funds are lacking. Surgical and medical supplies are available in only very small quantities. There are several structures which might be used as emergency hospitals.

Health regulations; quarantine.—No definite health laws or regulations exist. The local inspector of hygiene states that recommendations of a sanitary character would be useless since they would not be carried out. The only quarantine regulations are those that the inspector of hygiene might formulate as the occasion arises. Bills of health are procured from the consul of the country for which a ship may be bound.

Health conditions.—There are no epidemic diseases. The prevailing diseases are malaria and gonorrhea. The entire population suffers from malaria at some time or other. Newcomers soon contract the disease. There is no regulation or examination of prostitutes. Syphilis is prevalent. Occasional cases of blackwater fever appear among the whites. A few cases of trypanosomiasis are seen each year, but are said to come from farther inland. There are some cases of dysentery. No yellow fever or smallpox. Ancylostomiasis is rather widespread. Tuberculosis claims a number of victims each year. Several cases of elephantiasis were seen in the streets, and filarial infection is said to be quite widespread. Occasionally a case of leprosy is seen. Ulcers of the skin are quite common. Infant mortality is very high; probably 50 per cent do not survive the first year. Umbilical hernias are numerous, but rarely do they cause inconvenience or become strangulated. They are no doubt due to the method of breaking the cord, the nonuse of binders, and subsequent "banana belly." Quinin prophylaxis is used by the whites and indorsed by the physicians. Blackwater fever is considered to be a manifestation of chronic malaria and as such apt to be precipitated by the giving of large doses of quinin. The most frequent causes of death among the white population are malaria, blackwater fever, dysentery, pneumonia, and alcoholism.

Disease carriers.—Culex, anopheles, and stegomyia mosquitoes are present but not unusually numerous. A few glossinæ flies were noted along the streams.

Since arrival at Monrovia the *Chester* has visited the following Liberian seaport towns: Cestos, Sinu, Nana Kru, Cape Palmas, Cess Town, and Baffu. Most of these towns are located at the mouth of some small stream or behind a small point giving sufficient protection for the landing of surfboats and canoes. The population is mostly native. A few white traders and missionaries are located in each. Their climate, water supply, diseases, etc., are similar to those of Monrovia.

FREETOWN, the capital and principal seaport of Sierra Leone, is situated at the mouth of the Sierra Leone River which at this point is broad and deep with a moderately well protected harbor. It has a population of about 34,000, of whom about 1,200 are European residents and the remainder native African negroes. The climate is tropical, frequently essentially equatorial and very unhealthy for Europeans, so enervating and debilitating that the whites of the colonial and military services are required to spend but one year on duty in the colony followed by a furlough at home of four months for the colonial and six for the military.

Location.—The latitude of Freetown is 8° 29′ 45″ north and the longitude 13° 14′ 17″ west. It is built on rising ground gradually

sloping upward from the waterfront to Tower Hill, an elevated plateau, 386 feet high, on which are situated the principal military barracks. The streets are wide but unpaved, the houses mostly constructed in European style and of concrete or rough stone. It is the seat of the principal civil and military establishments of the colony.

Meteorological observations.—Except for the succession of dry and rainy periods there is no alteration of seasons. The wet season begins in April and ends in October. The total rainfall for the year 1914 was 102.34 inches, the lowest record in 33 years. At Hill Station, two and one-half miles distant, there was 133.92 inches. During the greater part of the year the tendency is toward excessive relative humidity, a condition which in a great measure accounts for the depressing debilitating effects of the climate. Westerly winds are the most frequent but during December, January, and February the *harmattan* frequently blows. The tides in the harbor run with great strength.

Medical topography.—The character of the surrounding country is hilly and farther back is mountainous. Mount Aureol just outside the city boundary has an altitude of about 1,200 feet and Hill Station, slightly farther back, of about 800. On the former are located the barracks of the native troops and on the latter many of the residences of the officers of the colonial service. A few miles distant are several other peaks, the tallest of which is Sugar Loaf with an altitude of 2,500 feet. Climatic conditions improve with the increase in altitude with the exception that during the wet season humidity increases, owing to the tops of these peaks being frequently shrouded in fogs. In the valleys between these mountains are located the reservoirs which supply the city with water. With the exception of the broad Sierra Leone River, at the mouth of which the city is situated, there are no streams of importance other than small mountain brooks, operative in the wet season only. The approximate area of the city is about 2¾ square miles. No portion of the city is subject to overflow. The geological formation is red laterite and no diseases other than ancylostomiasis are transmitted through the soil.

Water supply.—The source of water supply is reservoirs, numerous surface wells, 43 private tanks, and 1,025 barrels. The reservoirs are located several miles from the city in the mountain valleys and receive their supply from mountain streams. The source of water supply is fairly well protected from sources of contamination. There are 190 public standpipes along the streets and roads, 207 standpipes in compounds and houses, and private services with 653 taps. No processes other than by settling in reservoirs are used for filtering or

purifying. Ordinarily the quantity is ample for purposes of consumption and in case of fire. Progress is being made on a project to augment the water supply from sources in the Lumley Valley which will eventually give an almost inexhaustible supply. Reservoir water is considered to be of fairly good quality, but the local medical officers advise filtering it before use. The city possesses at the Colonial Hospital facilities for conducting chemical and bacteriological examinations of water, and during the year 1914 many examinations were made but during the present year war conditions necessitated the withdrawal of the pathologist to another colony. There are about 400 surface wells in the city. A few of these are operated by an interesting syphon-like system. A shaft is sunk, suction applied to start the flow, after which the water flows spontaneously. The medical officer of health has recommended the condemnation of wells as domestic water supply since they average a distance of only 37.3 feet from cesspits. In 1914 Dr. W. Allan conducted an interesting investigation on the subject of wells as breeding places for mosquitoes. He found that about 25 per cent of the wells contained mosquito larvæ. Following his investigation a methodical system of oiling was instituted, but only of wells found to contain larvæ and only with the consent of the occupiers of the compounds in which the wells were located. There is practically no typhoid fever in Freetown, one case in 1914, that of a European official, but during the same year there were treated at the various hospitals and dispensaries 296 cases of dysentery, of which 104 were amebic and 83 bacillary. At the out-patient departments treatment was given to 878 cases of "diarrhea."

Drainage and sewerage.—The city has no sewerage system but a fairly good system of street drainage by means of open gutters, many of which are of concrete or paved. All earth drains or ditches are cleared of grass several times a year. Human excreta is disposed of by the pail system, an average of 212 pails of night soil being removed daily. There are in the city 18 public latrines, 132 private latrines, and 3,182 cesspools. Scattered about the city there are 74 dust and refuse bins. On an average 175 men are employed daily in removing the night soil, emptying latrines, burning rubbish, burying empty tins and bottles, and clearing away undergrowth, long grass, and jungle. A squad of 7 men is employed daily in oiling drains, pools, cesspools, wells, water tanks, and barrels. There are several public open-air laundries. The city does not possess any gas or electric light plant and the streets are poorly illuminated.

Food supply.—Provisions, fresh meats, fruit, and vegetables can be obtained in moderate quantities, but, with the exception of meats, are very expensive. The city has two slaughterhouses, one public

and one military, both well paved and drained, and all meat in-spected by a sanitary officer prior to consumption. During the year 1914, out of a total of 3,742 bullocks slaughtered 23 were condemned on account of infection with *Cysticercus bovis*. Six public markets are in operation, four paved and drained, two unpaved, and all in good sanitary condition. Ice can be obtained in small quantities. There is but one hotel, small, and with very poor accommodations, but there are a few comfortable "rest houses" built after the custom of the British in India.

Hospitals.—There are four general hospitals in the city, two civil and two military, one nursing home, three dispensaries, one lunatic asylum, two hospitals for incurables (male and female), one leper asylum, and a hospital for infectious diseases. The buildings occupied by the Colonial Hospital were built in 1809 and were then used as a slave lazaretto; in consequence thereof they are old, constantly in need of repair, and unsuited for the purposes of a modern hospital. The Connaught Hospital, a new modern hospital of steel and concrete, was started during the year 1914, and considerable progress was effected, when, owing to the outbreak of the present war, building operations were suspended. The Colonial Hospital consists of a group of four 2-story masonry pavilions and has a capacity of about 90 beds. During the past year treatment was given to [illegible] intern patients, 9,174 out-patients, and 282 operations were performed. Though situated on the waterfront and easily accessible for landing patients transferred from ships, it admits practically none but colored patients. The principal medical officer was of the opinion that the admission of patients from men-of-war should be sought at the military hospital. It is ventilated by doors and windows, lighted by lamps, and the sanitary arrangements are not modern. The operating room is not modern in equipment and fittings, but nothwithstanding a considerable number of very successful operations were performed during the past year, among which were 15 for removal of elephantiasis of the scrotum with 4 deaths, 32 for radical cure of hernia with 3 deaths. Appendicitis practically does not exist. The hospital is equipped with a bacteriological laboratory, but at present very little work is being done owing to shortage of medical officers. There is no X-ray machine. The quality and quantity of food supply is good. The sick and injured are transported by wagon ambulance and hammock litters. The management of the hospital is under the control of medical men detailed from the colonial service, and the staff consists of a principal medical officer, a senior medical officer, two junior medical officers, one dental surgeon, a matron, and a chief dispenser. Nursing is done by a native staff consisting of 2 assistant dispensers, 15 male nurses and dressers, and 8 female nurses, with 5 female probationers. [illegible]

character of the medical and surgical work done at this hospital is very good. In another section of the city is located the Princess Christian Hospital, where 15 beds are maintained by the Church Missionary Society. Only women and children are received, and it has no staff of medical officers, the staff of the Colonial Hospital being called upon whenever necessary. A small Nursing Home with a capacity of 5 beds is also furnished medical attention by the Colonial Hospital. It is maintained for the care of Government officials and the whites of the mercantile and shipping companies. There are two military hospitals, one of 42 beds for white soldiers in the military reservation on Tower Hill, near the center of the city; another of 60 beds for colored troops at the barracks on Mount Aureol. Both are modern concrete buildings, built on the pavilion plan. The first has a well-equipped operating room and an X-ray outfit. At Kissy, outside the limits of the city, are located the Kissy Institutions, a lunatic asylum having 120 patients, a male and female incurable hospital with a total of 76 patients, a leper asylum with 4 patients, and a small hospital for infectious diseases. Outside of the hospitals surgical and medical supplies can be obtained in only small quantities from the local apothecary shops. There are several large buildings which might be used as emergency hospitals.

Information relating to health laws and regulations.—Sanitary affairs are administered by a senior sanitary officer and two superintendent sanitary inspectors, with offices in the "old female prison block" near the Colonial Hospital. For sanitary purposes the city is divided into 12 districts, all subject to a thorough set of rules and regulations, infraction of which is punishable by fine. During 1914 there were 746 convictions for violations of health laws, and fines totaling £139 1s. 6d. Nineteen sanitary inspectors patrol the city and make about 87,000 house inspections annually. Weeds, grass, and other vegetation are cut and removed, mosquito-breeding places thoroughly searched for, and pools and drains regularly oiled. Records of the names and addresses of malarial cases proven microscopically among the intern and extern patients at the hospitals and dispensaries are received by the medical officer of health from the medical branch. This information is followed up by the sanitary branch by inspections of premises at the addresses given and, when such action appears desirable, a letter of advice is written to the occupants, legal action being as far and as long as possible avoided, so as not to deter or prejudice attendance at the hospitals and dispensaries.

Quarantine.—The port sanitary work is also performed by the medical officer of health. From time to time he investigates the presence and degree of prevalence of the stegomyia mosquitoes in vessels at Freetown other than ocean-going steamers. On account of

illiteracy among the natives and for means of identification of persons arriving in the colony a system of finger prints is in use. There are no facilities for cremation in the city and permission to disinter is obtained from the governor of the colony. Bills of health can be procured from the harbor master, but should be viséd by the consul of the country to which a ship may be bound.

Health conditions.—The prevailing disease is malaria. In the year 1914 no less than 1,027 cases of this disease were treated in Freetown, 287 of which were diagnosed microscopically. The varieties of parasites found in those examined were in the following proportions: Subtertian, 74.5 per cent; quartan, 20.2 per cent; benign, 0.69 per cent; mixed, 4.6 per cent. At the Nursing Home, where most of the Europeans were located, there were 29 cases. Among 615 patients examined at the Colonial Hospital, malarial parasites were found in 287, or 46.6 per cent. In 1913 Dr. G. G. Butler found in observations on 100 native school children:

"1. Toward the end of the rainy season the apparently healthy children of Freetown, between the ages of 3 and 10, inclusive, show the presence of active malarial parasites in 50 out of the 100 examined.

"2. The percentage of infected children is alike for the children attending the Mohammedan and Christian schools.

"3. Of the children showing the presence of malarial parasites, approximately 83 per cent harbor the subtertian form and 16 per cent the quartan form.

"4. Between the hours of 10 a. m. and 12 noon the temperature of children harboring malaria parasites does not appear to be appreciably raised above that of children not harboring the parasites.

"5. The splenic index was found to be 43 per cent. It is shown in the results that the children harboring parasites in their peripheral blood have a considerably higher splenic index than those not harboring parasites."

Blackwater fever: A few cases of blackwater fever occur each year, three out of the eight deaths among the Europeans in the year 1914 being due to this disease. Most of the medical officers consider it a manifestation of chronic malaria, precipitated by lowering of resistance, chilling, or the taking of large doses of quinin.

Trypanosomiasis: Four cases of sleeping sickness were discovered in 1914, the parasites in these cases appearing to be of the gambiense type. It is rare that a case is diagnosed until the terminal stage of sleeping sickness is reached, when treatment is of no avail. Treatment consists in the use of galyl, atoxyl, ludyl, and other arsenical compounds. In the occasional case which does respond to the treatment the determination of permanent cure is usually not possible,

owing to failure on the part of the native to continue under treatment and observation.

Leprosy: During the past year there were 22 cases reported in the whole colony. Compulsory segregation is attempted at Kissy, where is located a leper asylum, but in actual practice the lepers almost invariably escape from the institution.

Tuberculosis: Freetown had 57 cases during the past year. Most of the cases show a massive infection and run an extremely rapid and fatal course. There has been an increase in the number of cases since the natives have assumed artificial methods of living and clothing.

Ancylostomiasis: Microscopic examination of feces of 986 patients showed the presence of ancylostome ova in 44.4 per cent among all classes of patients. The habit of going barefooted and the absence of floors in the huts favor the spread of this infection. During the above investigation four cases of rectal bilharziosis were found, probably the first recorded cases in the colony. The ova showed the lateral spine and in none of the cases was the urinary tract affected. The infection was a scanty one in each case and was not causing symptoms, and would not have been recognized except for the method employed in examining the feces. The natives infected came from four different tribes.

Filariasis: The night blood of 964 patients showed microfilariæ in 9.7 per cent, and 118 prisoners at the Freetown jail showed 11.8 per cent. Some medical officers estimate the racial incidence to be as high as 30 per cent. Cases of elephantiasis are quite common. The usual operation is done in the scrotal cases.

Yaws: Very few cases of this disease are brought to the dispensaries, it being regarded as a childish ailment which can not be escaped, but at Kabinkola, in an outlying district, an epidemic of over 100 cases was reported.

Yellow fever: There have been no recent cases of this disease. In 1914 one case was reported in a European at Boia, an upcountry railway station.

Smallpox: This disease is not epidemic, owing to the systematic administration of vaccine, and during the year 1914 only four cases of smallpox and five of chickenpox were treated at the infectious-disease hospital. The diagnosis of smallpox in West Africans presents a difficulty which is not experienced in the case of Europeans, the senior sanitary officer being of the opinion that some of the clinical conditions described under the makeshift name "acute craw-craw" may be true variola and as such, if not previously vaccinated, should be subjected to the vaccination test.

Venereal diseases.—These are very prevalent judging from the reports from the various dispensaries. Medical officers state that the

number of abortions and deaths in very early infancy, elicited on inquiry, together with ulcers, periosteal swellings, cutaneous gummata, and indefinite pains in the long bones, which rapidly improve under the administration of mercury and iodids, lead them to the conclusion that syphilis is very prevalent. There are no recognized houses of prostitution, and hence no medical supervision. In compliance with a request from the municipal authorities, liberty except to officers and chief petty officers ended at 5.30 p. m., and, in consequence, very little venereal disease developed during the stay of the *Chester* in this port.

Disease carriers.—Mosquitoes: Several species of culex, anopheles, and stegomyia mosquitoes are found in and about Freetown, but owing to the watchfulness of the sanitary inspectors, they are not at all numerous. Rock pools, hollows in trees, iron pipes, and tins, and axils of plants often furnish the breeding places. During the dry season the incidence of malaria is reduced one-half. In several examinations of 250 compounds taken at random the mosquito index was found to vary from 0.28 per cent during the dry season up to 25.2 per cent at the end of the wet season, and in the wet season 54 out of the 63 breeding places were in water-bearing plants. A number of experiments have been carried out with fish as destroyers of mosquito larvæ and it has been found that the Barbus is very active in eating the larvæ, swallowing in a short time what seem to be incredible numbers and showing marked preference for anophelines, possibly on account of their smaller size, the same preference being shown when pupæ were tried. Egg rafts were not touched unless broken up, when individual eggs soon disappeared. Experiments were also tried with two species, one large and one small, of frogs, as well as with tadpoles, but at no time did they seem to touch larvæ. In eliminating crab holes as a source of mosquito breeding, it was found that a mixture of coal tar and boiling water put into the holes through a metal funnel proved successful in entirely ridding certain areas of crabs.

Flies: The *Musca domestica* is practically never seen for the reason that there is no horse manure, it being impossible to keep horses on account of their being attacked by trypanosomiasis. Bloodsucking flies, including the glossinæ, exist.

Ticks: Several species of ticks have been identified. Relapsing fever does not exist.

Rats: The sum of 1 penny is paid for each rat brought to the Colonial Hospital. During the past year 1,750 rats were examined, and in no case was any condition resembling plague found. *Mus rattus* was the species most frequently found.

THE MOSQUITO COAST AND THE CAYMANS.

By W. W. Hargrave, Assistant Surgeon, United States Navy.

The survey work of the past season, from the middle of February to the middle of July, was confined to an area of 400 square miles among a group of cays (Mosquito Cays) from 10 to 25 miles off the northeast coast of Nicaragua. The cays are of coral formation. The majority of them are nothing more than reefs or small islets of coral rock. A few of the larger ones are covered with dense mangrove growth with an occasional growth of palms; uninhabited with the exception of one, which is occupied by a few turtle and sponge fishermen, natives of the Cayman Islands, where they return at the close of the fishing season. They live in their fishing schooners and in crudely constructed huts erected on piles, depending upon the local fish and provisions brought with them from their homes for subsistence. Although there are occasional lagoons and areas of stagnant water, no mosquitoes abound. The fishermen who go there regularly every year state that they have never been troubled by mosquitoes.

The survey work is carried on by the U. S. S. *Hannibal* and small boats using the ship as a base; the boats leave in the morning and return in the evening. The boats used for sounding and angle shooting are housed, thus affording protection to the occupants from the sun's rays to and from the ship, during lunch hour, and at other times when feasible. The open boats used for taking parties out for the purpose of erecting signals are provided with awnings to be used when needed. The ship comes to anchor every evening on the lee side of a cay in as close proximity to the place where the small boats are working as practicable. At noon every Saturday work is stopped and the ship steams for the Mosquito Coast (Nicaragua mainland) and remains at anchor, about 1 mile or more offshore, over Sunday. A camping party went ashore on the mainland at Bluefields Bluff, about 90 miles down the coast from the locality of our work and about 7 miles from the city of Bluefields, Nicaragua, for the purpose of carrying on astronomical observations. The party remained in this camp for a period of three weeks. Provisions, water, and drugs were carried from the ship. Prophylactic doses of quinin were given daily, and mosquito netting was used. The party suffered greatly from sand flies and mosquitoes. A rather severe case of impetigo contagiosa and a case of acute colitis developed. No malaria.

Mosquito Coast.—So called from its principal inhabitants, the Misskito Indians, whose name was corrupted into Mosquito by Euro-

pean settlers and has been entirely superseded by that form, except in the native dialects; the Indians are very intelligent, short of stature, and dark skinned, the latter due in part to their intermarriage with negroes. The coast is swampy and monotonous with its numerous lagoons and estuaries. In the neighborhood of the survey work the Indian villages are situated a few miles inland, in coconut groves, approached by way of lagoons and surrounded by savannas; the houses are constructed of bamboo poles with thatched roofs. A few are constructed of lumber. There is no flooring in most of them and the occupants sleep in hammocks or crudely constructed bunks. Their livelihood is obtained by fishing, from fruits, hunting in the back hills, collecting valuable feathers, and meager agricultural pursuits. There is a German missionary located among them who is doing a great deal of good. He teaches school, holds religious services on Sunday, renders medical attention, and acts as general advisor to the Indians in all matters. Tuberculosis and venereal diseases, especially syphilis, are very common. The writer cooperated with the missionary in treating many cases and has performed a few minor operations. Frequently week-end liberty parties are allowed to go ashore for recreation and to visit the Indian villages.

CAYMAN ISLANDS.—A group of low-lying islands, Grand Cayman, Little Cayman, and Cayman Brac, situated between 79° 44′ and 80° 26′ W., 19° 44′ and 19° 46′ N., mid-distance between western Jamaica and Isle of Pines, forming a dependency of Jamaica, which lies 178 miles east-southeast. The islands are of coral formation, and Grand Cayman, the largest of the three, is 17 miles long and varies from 4 to 7 miles in breadth. The inhabitants are of British descent, the islands having been colonized from Jamaica. The people are plain living, tall and well built, peaceable, and moral. Fruits are plentiful, particularly mangoes and plums. Phosphatic deposits are worked to some extent, but the principal occupation is turtle fishing. Turtles are caught in great numbers and exported to Jamaica, Colon, and Key West in their own schooners built on the islands. They are excellent shipwrights and sailors. The government consists of a commissioner and a legislative body styled the justices and vestry, this body consisting of 15 nominated and 28 elected members. The representation is roughly one for every 143 inhabitants. Laws are passed by the legislative body and are subject to the assent of the governor of Jamaica. The population is about 5,000. There is a medical officer, a member of the British medical service, stationed at Georgetown, the chief port of entry.

GEORGETOWN, GRAND CAYMAN.—This port has a population of about 1,800. The town is situated on the shore, which is exceedingly rock-bound, making it a very dangerous undertaking for boats to make a landing in rough weather. No prostitution exists. There is

no sewage system, surface closets being used by all. Water is obtained by collecting rain water in cisterns and from surface wells. The wells, as a source of drinking water, are never used except after a drought, when the people are forced to use them. Mosquitoes are very prevalent during the months of April to October, inclusive, and are a torment to man and beast, making life almost unbearable unless under the protection of netting or screens. Malaria causes considerable damage, and various forms of enteritis are common during a drought, when the inhabitants are forced to drink water from wells. Recently many cases of fish poisoning developed from the ingestion of local fish regardless of species. The use of them as food has been restricted. The symptoms produced are those of cholera morbus. The cause of this condition is unknown, except that it usually follows a heavy gale, when the ocean bed near the shore is stirred up.

No exanthematous diseases or endemic tropical diseases exist. On the whole, it may be said that the islands are exceedingly healthy, as evidenced by the great ages to which some of the inhabitants live. The officials are very strict as regards quarantine, and a very close supervision over the health of the inhabitants is maintained by the medical officer.

New Orleans.—This port was visited for a period of two weeks, in the middle of the season, for the purpose of granting liberty. Mosquito screens were installed, for the first and only time during the season, upon entering the Mississippi River. No contagious or infectious diseases were prevalent except those that you usually find in the average city. No human plague had been reported for several months, and no plague-infected rat had been caught during the week previous to our coming. We were required to conform to the following health regulations: Ship to be breasted off from dock a distance of 8 feet; 36-inch rat guards to be placed on all lines and hawsers; all gangways to be hoisted at night. The latter was waived in our case provided we kept a large cargo light burning over it and a man on guard.

The men were instructed in regard to venereal prophylaxis, and they responded fairly well to the request to appear for preventive treatment after exposure. Six cases of gonococcus infection of urethra and one chancroid developed when in and soon after leaving port.

The day before sailing the ship was fumigated at our request by the Public Health Service with carbon monoxid for the purpose of rat destruction. The gas is generated in a tug, which comes alongside, and is pumped through a canvas tube to the various compartments. Each compartment was subjected to the effects of the gas for a period of 35 minutes, after making it semi-airtight. Hatches were

battened down, ports and doors closed, and ventilators closed by stuffing with burlap or paper. No attempt was made to obtain a high degree of concentration, as is done in the use of other gases, as it is considered unnecessary for the purpose of rat extermination. This gas will not destroy flies, cockroaches, or vegetable life, but is considered very efficient for destroying rats.

The fumigation carried out on this ship was only partly successful. A few rats were seen aboard several days after the fumigation while we were at sea, there being no opportunity in the interval between the time fumigation was carried out and the time the rats were seen for any others to gain access to the ship. Two reasons can be advanced that will probably explain why all the rats aboard were not destroyed.

First, the entire ship was not fumigated, the engine and boiler room being excepted.

Second, frequently it is the case that rats escape asphyxiation even in fumigated compartments, due to their ability to hide in bilges or between the side plates and sheathing. The gas apparently fails, in many instances, to penetrate these recesses, and rats hiding in such locations seem to find sufficient oxygen to carry them over the period of exposure. On this ship at the time of fumigation it was a physical impossibility to open all dead spaces.

Climate of survey grounds.—The climate is distinctly tropical, with two seasons—wet from June to December, and dry throughout the winter months. Observations made during the period from the middle of February to the middle of July show mean maximum temperature 84.8 F., mean minimum temperature, 79.2 F.; mean barometer, 30.11 inches; relative humidity, 76; relative humidity for month of June, 88. The Mosquito Coast comes within the zone of the wet northeast trade winds. Observations made at Greytown in 1890 showed the rainfall for the whole year amounted to 297 inches, the rainiest month having been July (52.5 inches) and the driest May (4.9 inches). Usually the winds are sufficiently strong to render night sleeping on the deck comfortable. During the latter part of the season, owing to the excessive humidity and diminished winds some of the days are very oppressive and close. On the whole no great discomfort is experienced as a result of the heat, which is accounted for by reason of the more or less constant winds.

Skin diseases.—Urticaria, tinea cruris, dermatitis resulting from sand-fly bites, and staphylococcic infections are very common on the survey grounds. The greatest trouble is experienced with local abscesses of staphylococcic origin occurring at some site of friction or irritation or where the skin is abraded by traumatism. The hands and feet are the most common parts affected. These infections respond slowly to local treatment and in some cases are almost indolent.

As a prophylactic measure the men are required to wear footgear at all times during the day and an antiseptic dressing is applied to all skin injuries regardless of extent.

Lung conditions.—Cases of respiratory disease seem to pursue a very protracted and insidious course in this climate. A case of serofibrinous pleurisy following a cold developed several days after leaving Portsmouth, N. H., for the South. The patient was on the sick list for a period of 47 days, and was considerably below par after returning to light duty. The clinical symptoms, blood findings, and examination of serous fluid pointed to a nontuberculous infection. Patient lost no weight and had a feeling of well-being throughout illness, but ran a continuous temperature for seven weeks and had an effusion which was very slowly absorbed, all showing very low recuperating powers and on the other hand no marked toxic or debilitating effects. A case of pneumonia developed on the survey grounds, characterized by the typical symptoms of the disease at the onset and during the first few days, but later failed to undergo resolution, and after a long period of illness had to be transferred to New Orleans via United Fruit Co.'s steamer. This case also showed no marked debilitating effects but failed to improve. Care should be taken to eliminate those suffering with or susceptible to lung infections by ships doing duty in this climate in an isolated area where it is impossible to transfer or send North except at great expense and inconvenience.

LA ROMANA, SANTO DOMINGO; ST. MARC AND GONAIVES, HAITI.

By J. B. Helm, Assistant Surgeon, United States Navy.

La Romana, Santo Domingo, is a town of about 3,000 inhabitants, located at the mouth of the Romana River, and is about 40 feet above the sea level. No portion of the town is subject to overflow, but it is often marshy on account of the low level land which prevents drainage. The town proper, so far as the cleanliness is concerned, is much above the average tropical town.

The water used by the inhabitants comes from a spring located 4 miles in the mountains, and is brought to the city by surface concrete trough for 1 mile, the remainder through pipe lines. This water empties itself by gravity into a well, located about the center of the town, from which the inhabitants obtain their water. The well is rock walled, and around the top of it is a sloping concrete base which extends about 2 feet under the ground. The well is kept covered and the sloping base carries away any waste water. There are no diseases attributable to this water.

There is no sewerage system, but the sandy land favors the absorption of waste material, especially in dry seasons. There are very few privies even of the primitive type, and human excreta is deposited in the yards or a short distance from the house. These privies are extremely insanitary, since nothing is used to cover the excrement, and they are not built to exclude flies and other insects.

The food is scanty and coarse, is sold mostly by venders about the city, many of whom have filthy diseases, and the food is exposed to dust and flies.

This is the terminus of a privately owned railroad, which runs 12 miles inland to the La Romana sugar plantation. An American physician, with headquarters in La Romana, is employed by the company, and his equipment and accommodations for treating the sick are fairly good. There are no hospitals in the town.

St. Marc, Haiti.—This is a town of about 8,000 inhabitants, located at the base of a mountain range, which is probably 700 feet high. The town is very near the sea, extending along the water's edge for about 1½ miles. It is about 20 feet above the sea level, on a slight incline which gradually slopes toward the sea. It is 1 mile from the sea to the base of the nearest mountain. It is a very favorable location for a town of this size, in so far as the topographical features have influence upon health conditions. A small stream flows rapidly through the town, emptying into the sea. The climate is good for a tropical town, there being, through the day, a sea breeze and through the night a shore breeze. No part of the town is subject to overflow and there are no diseases attributable to the geographical location.

The water supply comes from a spring in the mountain about 2 miles from the city. Pipe lines bring this water underground to a fountain located in the public square near the center of the city. The inhabitants secure their supply of water from this fountain, where there is always ample and continuous flow. Underground drainage carries the overflow water from the fountain to the sea. The public square in which this fountain is located is used as a market place, which is very convenient for the many people who attend market each day. Also a concrete trough is erected around the base of this fountain, from which animals are watered. There are no reservoirs or filtering plants. The town possesses no facilities for water examination. There is no sewerage system in the city, only surface drains being employed. Some of the streets are paved with rocks, others not at all, but the surface drains are built in the middle of the streets and both sides of the street slope toward the drain. These drains converge into larger ones which empty by gravity into the sea. The town is filthy. There are a few private privies in the town, which are open to all kinds of insects, and are

insanitary to the extreme. By far a greater part of the human excreta is deposited in the yard about the houses or in the streets. These people are of very low morals and usually defecate at the place where they happen to be when the impulse strikes them. No pretense is made to clean the streets or remove the animal excreta. The central square, which is open, is covered with animal excreta, numbers of hogs and goats passing at will, while the people sit around on the dirty, bare ground selling their wares. The surface drain is often dammed up with débris of all kinds, but no one makes a pretense of freeing it. The town is lighted by street lamps filled with oil. There is one hospital in the town, Hôpital de Soeurs. It is a religious institution (Catholic), managed and run by Sisters of Charity, three in number, and is supported by the Haitian Government and private donations. It is strictly charity, but open to all. It consists of two one-story buildings, besides the chapel for divine services, surrounded by a rock and cement wall about 7 feet high. The smaller of the buildings contains two rooms, one used as a reception room, the other as a workroom and storeroom for supplies; the other building is partitioned into four rooms, having a total capacity of about 15 patients. There are no beds in the hospital; the patients lie about on straw mats laid upon the dirt floor. There is absolutely no hospital equipment whatever, no bedding, no blankets, sheets, or pillows. Patients never change their clothing, but bathe occasionally, as there is a pool of water near the hospital. They get practically no food except fruits. This hospital serves as a place to stay for people who have diseases which prevent their working. Each patient who is able to get about at all goes out and begs his own food. There are a few drugs on hand; all kinds of material is used for bandaging. The conditions as a whole are miserable. The two doctors in the town do not visit the hospital. The three sisters, who are French, deserve much credit for working with these people under these circumstances.

Since the American occupation many of the bad features have been corrected. The streets, yards of all houses, and vacant lots have been cleaned, the rubbish hauled away and burned, and the general sanitary aspect is much brigher. Several men were employed to clean up the town and it was done systematically. At present the prisoners are required to work on the streets, which keeps them in fair condition; owners are required to keep their property clean; four privies have been built and placed in convenient locations about the town, and in as sanitary a manner as possible, and it is made a misdemeanor for any person using the street or yards for depositing their own excrement or allowing rubbish of any kind to accumulate on their premises. The writer visited the hospital a number of times, treated several cases that were in urgent need, and supplied bandages and dressings in limited quantities. Three emergency operations were

performed upon natives, and a number of outdoor patients were treated. An opportunity was taken during each of our visits to this port to visit the hospital and treat those cases which were most in need.

There are no diseases of epidemic form, but tuberculosis, leprosy, syphilis, tropical ulcer, and dysentery are always found. Malaria is not so prevalent here, since mosquitoes are few, and their breeding places are very limited.

GONAIVES, HAITI.—This is a city of 11,000 inhabitants, located at the head of Gonaives Bay, on a plain which stretches 5 miles from the sea to the nearest mountain range. There are two rainy seasons during the year—in the late spring and early fall—each lasting about six weeks. The rainfall during the rainy season is not great, since it occurs about every second or third day, but before the ground has dried from the last rain. These rains serve to wash a certain amount of the dirt and filth from the city, but it is usually about two weeks after the rains have stopped that a very pernicious form of malaria breaks out. This is accounted for by the fact that during the dry season breeding places for mosquitoes are limited and therefore mosquitoes are not prevalent. During the rainy seasons these breeding places are washed out by each rain, being replaced by other water and the breeding interrupted; but after the last rain the water becomes stagnant, making an ideal breeding place for mosquitoes, and they multiply very rapidly. This accounts for the outbreaks of malaria which occur about two weeks after the last rain, and which are of a very pernicious type, especially during October and November of each year. Malaria is always present, the determining factor in the control of it seeming to be the scarcity of anopheles during the dry season and their great numbers soon after the rainy season. The maximum and minimum temperature records for each 24 hours during the latter half of August and the month of September, usually the fall rainy season, are given below:

Temperatures of outside air.

Date.	August.		September.	
	Maximum.	Minimum.	Maximum	Minimum.
1			97	73
2			95	84
3			89	75
4			95	75
5			93	73
6			89	75
7			91	78
8			84	78
9			90	78
10			92	76
11			89	75
12			93	77
13			91	78
14			90	76

Temperatures of outside air—Continued.

Date.	August.		September.	
	Maximum.	Minimum.	Maximum.	Minimum.
15	92	77	90	77
16	89	77	91	78
17	91	79	90	76
18	93	83	90	76
19	90	78	90	77
20	89	77	90	77
21	89	75	92	75
22	89	77	92	78
23	86	76	89	78
24	86	77	95	82
25	87	77	93	81
26	90	75	91	80
27	92	75	92	81
28	90	76	92	79
29	90	60	92	76
30	90	60	89	73
31	89	75	....	....

The surrounding country is mountainous, which mountains completely surround the plain on which the city is located. This plain is low and marshy, its highest point being not over 10 feet above the sea level. This prevents drainage, allows mosquito-breeding places to obtain, causes dampness and filth to exist, and creates a condition which causes general lowered resistance to disease, and unhealthiness throughout the community.

The city covers an area of about one and one-half square miles, the northern and southern parts of which are especially subject to overflow. There is a very small stream, of extremely sluggish current, passing through the city. This flow continues to be interrupted by the natives throwing all manner of rubbish and débris into the channel.

Malaria is attributed mainly to the conditions mentioned above, as are various intestinal and skin diseases, which, if not actually caused, are greatly influenced by these conditions.

The water supply is obtained from a spring located 5 miles northwest of the city in the mountains. The water is carried directly from this spring through pipes by gravity to a reservoir located in the mountain 1 mile toward the city. From this reservoir a 6-inch pipe carries the water by gravity to the city, where branch pipe lines are given off which carry water to different parts of the city. These branch lines are tapped at different points, where a small pipe is inserted which carries the water about 18 inches above the ground, consumers obtaining it through a faucet. No filtering method is used other than settling in the reservoir. The city possesses no facilities for the examination of water, and there are no diseases attributable to the use of it. There are also many private and a few public wells and cisterns, the water being brought to them from the roofs of houses. These are poorly built, since nothing prevents the

seepage of water from the surface into them, the covers being badly constructed, the opening almost level with the ground in many instances, and they are usually left uncovered, with nothing to prevent the entrance of small animals, insects, and dirt. This water is used mostly for washing, but some drink it as well.

There is no sewerage system. All the refuse and waste material in the city must be carried by surface drains. A few of the streets have surface drains, others no drains at all. All rubbish and garbage is thrown into the streets, a few people have private privies which are so constructed that flies and other insects easily gain admission; the deposits are not covered, leaving an open cesspool, the odors from which are very offensive. By far the greater majority of the population deposit their excrement in the yard adjoining the house, in vacant lots, or in the streets. It is a common occurrence to see men or women urinating or defecating in the streets.

The market is located in a low place near the center of the town, and consists of a large open square with numerous upright poles scattered about, partially covered over with thatch to protect the people from the sun. The space in and around the market place serves as a standing place for animals, the manure from which has accumulated until it is several inches deep. Five hundred to 1,000 people gather in this market daily, sit on the bare ground in the dirt, and dispense their wares. Food and meats, both cooked and raw, are sold from open platters with no protection from the dust, dirt, and flies. When an animal is slaughtered every particle of it is brought into the market and sold, even to the head and intestines. The odors coming from this market, where animal and human excrement are deposited and decayed foods sold, is offensive to the extreme and creates probably the most insanitary condition I have ever witnessed.

The slaughterhouse is located in the southern part of the city in an open field and consists of upright poles with crosspieces upon which the carcass is hung. The manure covering this place is probably 12 to 18 inches deep.

The jail is surrounded by a rock-and-cement wall 10 feet high. Against this wall, on the inner side, private cells are built, each about 10 feet square and with a door opening into a central square. These cells have no floor, are damp, light is excluded, and they are poorly ventilated. In this jail men, women, and children are placed all together. Their food is coarse and scanty. The place is filthy and large piles of manure and refuse are in the central square. One of the cells is used for depositing human excrement, which is never removed so far as I could judge. It is extremely insanitary and the odors arising from it are very offensive.

All sewage, refuse, and rubbish being thrown into the streets, the surface drains are stopped, causing pools of stagnant water all

over the city. This, with the assistance of the level land, creates a condition which is insanitary to the extreme.

Tuberculosis, leprosy, tropical ulcer, and malaria are always present. Malaria also occurs epidemically. Gonorrhea, chancroidal infections, and syphilis are extremely prevalent. No attempt is made to identify or segregate prostitutes, but they are in all parts of the city in great numbers. No medical inspections are made of these women. They are all filthy and do not practice the first principles of personal hygiene.

There are no vital statistic records kept, but from observations made it is estimated that the death rate is very high. There is one hospital in the city, Hospice Gonaives, a general hospital located in the northeastern part of the city. The general sanitary conditions are bad, since it is located in a low, marshy place, with no plumbing or drainage system except surface drains, no running water (water is used from a cistern), kerosene lamps and candles furnish the lights, and human excreta is deposited in a pit over which is a poorly constructed house which does not exclude flies or other insects.

The hospital has three buildings, surrounded by a rock-and-cement wall:

(*a*) Administration building, which is of two-story, rock-and-cement construction, in which is located the reception room, work-room, dining hall for attendants, and quarters for same on second floor. Adjoining this there is a one-story frame building which is used as a ward for women.

(*b*) Small one-story building, consisting of three rooms, two of which are used as private rooms for patients, the other as a dispensary.

(*c*) One-story frame building used as men's ward.

None of the buildings are modern in any particular and their equipment and furnishings are very poor. There is no operating room or surgical equipment, although they have a limited supply of medicines and plain dressings. There are two doctors in the city, each of whom visits the hospital once a week. Treatment in general is initiated and carried out by the Sisters of Charity.

During our stay in this port I have visited this hospital a number of times, treated a number of patients, and performed several operations; also supplied a limited amount of gauze and dressings for the surgical cases. The hospital has 36 beds, but space for 20 more. It has no X-ray, sterilizer, nor method of disinfection except by solutions. It is a religious (Catholic) hospital, managed and run by Sisters of Charity. The hospital is supported by the Haitian Government and by private subscriptions and donations. A new addition is being built, which will be a two-story brick building, with

private rooms for pay patients on the second floor, and an operating room, dispensary, and two wards on the lower floor.

Since the American occupation of Gonaives, a great deal has been done to remedy the insanitary conditions. A force of 70 men, with horses and carts, under an intelligent supervisor, was employed to clean up the city. For three months this work has been in progress; the surface drains have been cleared and cleaned, other drains widened and deepened, refuse and rubbish either burned or hauled away, and the most insanitary features corrected, which has produced a great change for the better. The gutters and streets are now kept fairly clean, streets are being filled with rock and dirt so as to force drainage, and laws against nuisances enforced. Weekly inspections are made of the city and all are required to keep their premises clean. As a consequence of this work, conditions have been greatly bettered. But there is no sewerage system, and on account of the low land it would require an enormous expenditure of money to install an efficient system. However, until some system of sewage disposal is inaugurated, all the work that can be done with the present means can no more than approach the average sanitary necessity.

LA CEIBA, TELA, AND PUERTO CORTEZ, HONDURAS; PUERTO BARRIOS, GUATEMALA.

By T. A. Fortescue, Assistant Surgeon, United States Navy.

La Ceiba is situated on a narrow strip of land having a long range of mountains on the north and the open sea on the south. It is a town of about 12,000 inhabitants. Of its entire population, about 250 are Americans, about 100 are Asiatics, and about 2,000 are Jamaicans. The soil is sandy. There is excellent natural drainage, the slope of the land from the foothills of the mountains to the sea being about 1 foot in 100. The streets are unpaved, but are kept fairly clean. Garbage is collected and emptied into the sea daily.

The water is supplied from the Danto River. The source of this stream is found in many mountain springs. The intake is located about 5 miles above the town, in the mountains. It is built of concrete, completely covered and in size is about 20 by 20 feet. Bacteriological examination of the water showed it to be free of pathogenic organisms. It is carried to the town in 12-inch iron pipe mains under a pressure of 62 pounds to the square inch. There are no water-borne diseases at present in the town, nor have there been any recently.

The sewerage system covers about two-thirds of the town. The sewers—24-inch terra-cotta pipes—drain into the sea, about 250 feet from the shore. The other third of the town—poorer classes—

use the old vault privies. However, these are to be replaced shortly by the Stiles closets.

Mosquitoes and flies are very numerous. The predominant types of mosquitoes are the anophelinæ and culicinæ. There is a moderate amount of malaria and a few cases of tuberculosis in town.

There are two hospitals in town. One is a municipal institution and the other is maintained by the Viccaro Bros. Banana Co. for employees. Both are in a dilapidated, filthy condition. Neither has an operating room nor a dispensary. As hospitals both are rank failures.

The food supply is fair but of poor variety. There is an antemortem inspection of all beef used in town. Many fresh vegetables are imported from New Orleans. Excepting the houses in the American colony—called Masapan—there is no screening in town. All markets are entirely exposed to fly and dust contamination. There is an ice plant of ample capacity run by Viccaro Bros.

Though there is a biweekly medical examination of all prostitutes, there is an enormous amount of syphilis and gonorrhea present.

Tela, Honduras.—The town is situated on low-lying land. It is distinctly divided into two sections known as Old and New Tela, respectively.

New Tela is entirely occupied by employees of the United Fruit Co. Its population is about 2,000, of which about 250 are from the United States. The remainder is composed mostly of Jamaicans. This section of town is under the direct supervision of the medical department of the United Fruit Co. The streets are broad and unpaved but clean; there is a cesspool system of sewage disposal. The water supply is piped from a near-by river and is regularly examined bacteriologically. Also, some deep wells supply water for laundry purposes, etc. The bases of all houses are raised above the ground, and they are all excellently screened. There is a large company hospital located in the eastern end of the town, which is modern in every particular. It is capable of accommodating about 250 patients. The hospital staff is composed of two company surgeons, who appear to be particularly efficient medical men. There is an ice plant and electricity. Generally speaking, the sanitation of this section of town is excellent.

Old Tela—or that section which is occupied by natives—has a population estimated at 5,000. Concerning sanitary features, it is just the reverse of New Tela. Its streets are narrow, crooked, unpaved, and filthy. It has no sewerage system, no water system, no system of garbage disposal, and it is surrounded by swamps. In New Tela all such places have been filled in. In both sections, but particularly in the old, mosquitoes are very numerous. Their types

correspond to those of La Ceiba. There is much malaria here, but otherwise it is a very healthy place.

The food supply is ample and of good variety. A large quantity of fresh vegetables are imported from New Orleans.

PUERTO CORTEZ, HONDURAS.—The town is situated upon a narrow strip of land, the greatest width of which is about 100 yards. In front lies the bay and behind is a large lagoon and a great amount of swampy land. The whole town is built on either side of the railroad. There are neither sidewalks nor roads, only footpaths alongside of the railroad tracks.

There are two sources of water supply. One—that is used for washing only—comes from a small mountain stream about 2 miles beyond the town. There is a reservoir in the hills from which the stored water is distributed by force of gravity to numerous houses in the town. Although this appears to be of good quality, it is never used for drinking purposes. That used for drinking is rain water. Nearly every house has a large tank for collecting this. These tanks are well constructed and appear to be kept clean.

Sewage is disposed of by way of open sewers. Roughly, about every 50 yards along the railroad, running from the lagoon and swamps to the bay, are small ditches or creeks which are used to carry sewage into the bay. These are absolutely unprotected, man or beast having free access to them. There are many privies built over the waters of the bay and over these small streams. Practically the whole town uses these privies.

All markets and stores, and most of the houses, are unscreened. All articles for sale are open to dust and fly contamination.

Mosquitoes are very numerous, owing to adjacent swampy land, and the stegomyia is the predominant type. Several years ago there were some large epidemics of yellow fever in town, but at present there is none, nor has there been any recently. Malaria is said to be the one prevalent disease at present.

There is no hospital in town.

There is a port health officer whose duty is to grant pratique to all incoming vessels. Outbound ships are required to get bills of health from the consular representative of the country for which they are about to sail.

Men-of-war require neither pratique nor bills of health, the word of the medical officer being accepted in all cases of doubt.

There are no regulations for the disposal of garbage.

PUERTO BARRIOS, GUATEMALA.—Puerto Barrios contains about 100 houses. Its population is estimated to be about 1,000 people. About 50 of these are foreigners; the remainder are natives. Of the houses, six are modern buildings, erected and maintained by the United

Fruit Co. The rest are native huts and houses and are in a sad state of insanitation.

The town is surrounded by low, swampy ground, and, of course, natural drainage is practically *nil.* Mosquitoes, mostly of the anopheline type, abound in vast numbers throughout the town. No move has been made—nor is any contemplated—to eliminate the adjacent swamps. Excepting the United Fruit Co. buildings, there is no screening in town; and the one prevalent disease is malaria. So far as I was able to ascertain, there are no other infectious diseases present.

There is no sewerage system in town. But out on the waters of the harbor there are several privies which are for the use of the public. There are two small creeks running through the town and some houses situated on their banks are thus drained of sewage.

Water is supplied by wells and from a small river, well toward the foothills of a range of uninhabited mountains. This water is said to be very good. A few residents use rain water.

There is no hospital in town. At Quirigua, a town about 60 miles inland on the Guatemala Northern Railroad, is situated a large, modern hospital, erected and run by the United Fruit Co. for the treatment of its employees. It is a new hospital, electrically lighted, excellently screened, underground drained, and installed with all the appliances of modern medicine and surgery. Its staff is composed of three members of the United Fruit Co. medical department, and they appear to be well-informed, efficient medical men.

In quantity the food supply is fair; in quality—excepting bananas—and in variety it is very poor. All vegetables, meat, fish, etc., in stores and market, are freely exposed to fly and dust contamination. There are no regular collections of garbage or household refuse, and these materials litter the streets and yards of houses.

TAMPICO AND VERA CRUZ.

By A. E. Younie, Assistant Surgeon, United States Navy.

Tampico, Mexico.—The *Sacramento* was anchored in the Panuco River off Tampico from December 20, 1914, to June 23, 1915. During this time no regular liberty was allowed owing to unsettled conditions and open hostility shown by the natives. Sanitary conditions in towns were not good. Mosquitoes, both anophelines and culicines, were very numerous and voracious. Quinin in doses of 5 grains was given daily as a prophylaxis, and the ship was thoroughly screened, with the happy result that not a single case of malaria occurred on board during our entire stay of over six months, with the exception of the medical officer, who developed a beautiful

case of malignant tertian fever which refused to respond to quinin by the mouth, but cleared under injections of the bimurate. The medical officer was probably the only one who neglected the prophylaxis. During this time malaria of all types was extremely prevalent in Tampico, and on merchant ships and interned ships anchored close by numerous deaths occurred. This experience convinces me of the value of quinin prophylaxis, if given at quarters where the men can not evade actually taking it regularly, as an adjunct to mosquito protection and mosquito extermination. After leaving Mexican waters quinin was discontinued, and but one case of fever developed, which was easily controlled by quinin. No deleterious effects from the long-continued medication were observed.

Variola was epidemic during our stay, especially prevalent in the Carranzista army. Cases developing in the interior were brought to Tampico and Vera Cruz ostensibly for treatment. No effectual isolation or treatment, however, was carried out, and as the disease seemed to be an extremely virulent type the mortality was exceptionally high.

Dengue was common among the better class of native citizens as well as among the foreign colony. Several deaths occurred which aroused suspicion of yellow fever, but necropsies disclosed other causes of death.

Intestinal diseases, such as dysentery (bacillary and amebic), enteritis, and undoubtedly typhoid fever, were fruitful causes of death, due no doubt to the general filth, dirt, and flies contaminating the food.

Fresh food was very hard to obtain and of poor quality. Beef was tough, stringy, and without fat; pork and mutton practically nonexistent; and the chicken dry, tough, and unpalatable. Irish potatoes could only be obtained when the bimonthly Ward Line steamers arrived. Fresh beans, peas, lettuce, corn, and cabbage were not obtainable. Alligator pears, oranges, and grapefruit, as well as mangoes and bananas, were plentiful in season and were a great aid to a diet almost exclusively of canned goods.

Vera Cruz, Mexico.—We arrived at Vera Cruz on June 26, 1915, and remained in this port until August 11, 1915. Hygienic conditions here, also, were bad. The streets were filthy, with garbage very much in evidence, decaying on the streets and attracting myriads of flies and other insects.

No general liberty was permitted here on account of conditions ashore, as well as a very virulent epidemic of variola. A few small parties for recreation in charge of an officer were allowed ashore.

The prevailing diseases were of the same general type as at Tampico. There were no American physicians in Vera Cruz, and consequently it was extremely difficult to ascertain either the death rate or the prevalent diseases. Enteritis appeared to head the list

(exclusive of variola) upon which data were obtainable. The term enteritis probably included dysentery, choleriform malaria, and typhoid fever, although the native health authorities denied the presence of typhoid.

The food problem was the same as in Tampico, excepting that the beef could not be used owing to the fact that the lymphatic glands in practically all the animals were found to be enlarged, with necrotic centers. A large nonmotile bacillus which resembled anthrax was isolated. The exact nature of the disease could not be determined, but it was thought best to prohibit the use of such beef.

No systemic quarantine or health laws were in force during our stay in Mexican waters. About the only ships boarded by the health officer were the American ships.

Haiti.—From September 11 to December 16, 1915, the *Sacramento* was cruising in Haitian waters. We arrived at Port au Prince September 11, leaving shortly thereafter with marines for transportation to western and southern coasts. From this time on until our departure for Norfolk, Va., on December 16, we were cruising continuously between Port au Prince, Petit Goave, Miragoane, Jeremie, Aux Cayes, Aquin, and Jacmel.

The most prevalent diseases in southern Haiti are malaria, dengue, and enteritis. Venereal diseases are practically universal among the natives.

Small liberty parties were allowed ashore in Port au Prince, Aux Cayes, and Jacmel.

The ship was always anchored far enough out at all times to prevent mosquito infection, and very little sickness occurred with exception of several stubborn cases of lymphadenitis acute (nonvenereal) corresponding to the so-called "tropical or climatic bubos." These bubos proved very troublesome, incapacitating those afflicted with them for a long period and responding slightly if at all to treatment.

Toward the end of our cruise boils in large numbers commenced to develop among the personnel. Both of the above conditions would appear to be due to insufficient fresh vegetables and fruits, together with too long a stay in tropical waters.

Upon December 16 we sailed from Port au Prince to Portsmouth, N. H., via Norfolk, Va., arriving at the latter place on December 22 and the former on the 30th. The sudden climatic change resulted in one case of pleurisy and numerous colds. A short stay of five days in Norfolk en route helped to acclimate the men and no serious effects are anticipated, although it will doubtless be some time before the various minor manifestations of exposure will disappear, especially as the heating facilities on this ship are not adapted to a cold climate.

PROGRESO, CARMEN, AND MERIDA, MEXICO.

By J. F. Riordan, Assistant Surgeon, United States Navy.

Progreso, Mexico.—*Water supply.*—For water the city is dependent entirely upon water collected during the rainy season and stored in cisterns above and below the ground. The water is very hard and is frequently contaminated with sewage. It is customary to boil or filter the water before using.

Hospitals.—There are no hospitals. The port sanitary officer has a building he uses to isolate suspects. All serious cases are sent to the municipal hospital at Merida.

Epidemic and endemic diseases.—The greatest damage is done in infants from intestinal diseases. The mortality here and in the surrounding country is terrific. The local health officer attributes this to the very bad water and to the carelessness in not boiling it. The last case of smallpox occurred in December, 1915. Smallpox was then introduced by Federal troops who were imported from northern Mexico. Only three cases developed in the civil population. At present Progreso is quarantined against Campeche and the interior of Yucatan because of smallpox. For a person to enter Progreso from these localities he must have been positively vaccinated just before leaving or must have been unsuccessfully vaccinated three times at four-day intervals before leaving the infected locality. The crews of the Mexican Navigation Co. are very thoroughly vaccinated and they are not subjected to these rules. Mosquitces are troublesome, but there have been no cases of yellow fever for several years. Malaria is not very frequent and never assumes serious proportions. The United States authorities maintain a quarantine against Progreso, requiring that vessels loading for the United States do so only during the daytime and that they be fumigated for mosquitoes before leaving for the United States. The Mexican authorities consider this unfair to them because there is no yellow fever here and practically no malaria and because the greater part of the loading is done from 2 to 5 miles offshore, usually in a brisk breeze, and because the yellow-fever mosquito is usually a house mosquito.

Food.—At present there is practically nothing on the market. The market place is not clean and is very poorly kept.

Availability of medical and surgical supplies.—No medical or surgical supplies are available at this port.

Bill of health.—Men-of-war need no bill of health, but it is customary to request one as a courtesy. In case of infectious diseases aboard a man-of-war it is expected that no one will land until the nature of the cases is explained to the health officer of the port.

Carmen, Mexico.—*Water supply.*—For drinking purposes the water is collected during the rainy season and stored in underground

and aboveground cisterns. For washing, for watering plants and cattle, and for commercial purposes the water is obtained from drilled wells and is pumped into the storage tanks by windmills or gasoline engines.

The water obtained from the wells is brackish and is only used for drinking by the native population. The supply obtained from the wells is plentiful.

Drainage and sewerage.—There is no system of drainage in the town. Human excreta is disposed of in privies. A few houses near the beach have flushing systems that drain into the harbor.

There is a system of garbage collection in force and from the appearance of the streets the system must be fairly efficient.

Hospitals.—There are two hospitals in the town, one an isolation hospital for smallpox, the other a municipal hospital for medical and surgical cases. No contagious diseases are accepted at this hospital. The municipal hospital has a capacity of 80 beds.

The building is well planned and is kept clean. No effort is made to screen the place. The hospital has practically no surgical equipment. The medical personnel consists of one doctor employed by the city of Carmen.

Health organization.—The health organization of the town is under the municipal health officer and the port health officer.

As nearly as can be learned the health laws, if such exist, are very poorly carried out. At present very little is being done to suppress the epidemic of smallpox.

Epidemic diseases.—At present there is an epidemic of smallpox in the town and in the surrounding country. This epidemic is confined to the native population and to the native quarters. There are from 80 to 100 cases in the isolation hospital and at home and under observation of the health authorities, and probably twice that number not under observation and at liberty to go about the town. This epidemic is not particularly severe, but there have been a few cases of hemorrhagic type.

There are no other epidemic diseases. A few cases of malaria are always present.

Here as in other Mexican ports the infant mortality is very high. This is attributed to the hot climate and the poor water and milk supply.

Venereal diseases.—The prostitutes are subjected to physical examination weekly. How thoroughly this is done can not be learned.

It is claimed that venereal diseases are not particularly prevalent here.

Availability of medical and surgical supplies.—It is impossible to obtain medical or surgical supplies of any kind in this town.

MERIDA.—*Water supply.*—The water supply is obtained from wells. The water contains large amounts of salts and considerable bacterial contamination. Because of this bacterial contamination it is the universal custom to boil all water before use for cooking or drinking.

Sewerage.—Practically the entire city is well drained by an underground sewerage system placed at a depth of 8 feet below the level of the street.

Hospitals.—There are three hospitals in Merida. One a civil hospital, one a military hospital, and the third a yellow-fever hospital. The civil hospital and the yellow-fever hospital are under the control of the State of Yucatan. The military hospital is controlled by the Mexican Federal authorities.

The municipal hospital has a capacity of about 500 beds. It is located in a well-kept park, and is constructed on the pavilion plan. The buildings are of stone and concrete with tile floors. Each building contains about 30 beds. The wards are well lighted and are kept in a fair sanitary condition. Each building is entirely apart from the others, but all are connected by covered walks. Considerable distance from the principal group of buildings are the wards for the isolation of tubercular patients. The hospital has two operating pavilions, one for males and one for females. These operating pavilions are well equipped. The principle of isolation of diseases is well carried out. The entire plant compares very favorably with hospitals of this class in the United States. The severest criticism that can be made from a rather hurried inspection is that little effort is made to protect from flies.

The State of Yucatan and the Mexican Federal Government maintain a well-equipped bacteriological laboratory in Merida. Here cowpox vaccine, diphtheria antitoxin, and antirabic vaccine are made. The staff of this laboratory is composed of medical officers employed by the Federal Government. It was impossible to visit the military and the yellow-fever hospitals because of lack of time.

Health organization.—The city is divided into districts, each under the supervision of an inspector. The equipment seen was modern. It is understood that the health regulations are well enforced. The cost of this organization is defrayed in part by the State of Yucatan and in part by the Federal Government.

Epidemic and endemic diseases.—Here as at Progreso the greatest mortality is from intestinal diseases, especially the intestinal diseases of children. The milk supply, as well as the water supply, is very poor. The prevalence of intestinal diseases is attributed to these two causes. The medical men are making efforts to educate the people to boil both the milk and the water before using. The last case of yellow fever occurred three years ago. Smallpox shows only occasionally and then in isolated cases. During the last year an

epidemic of smallpox occurred when the Mexican troops from the north of Mexico were sent to Merida. The outbreak was confined strictly to the troops. Typhus fever is unknown here. Typhoid is also very uncommon. During the rainy season malaria occurs, but the number of cases is not great. During the winter months scarlet fever, measles, and other diseases of children appear, but seldom in an epidemic form.

Venereal diseases.—Prostitution is very carefully regulated. It is claimed that venereal diseases are not as prevalent here as in other Mexican ports.

Mosquitoes.—During the rainy season mosquitoes are pests, and even now they are very troublesome.

Markets.—The one central market visited was large, clean, and in excellent sanitary condition. The assortment of fresh fruits and of fresh vegetables was very good.

Availability of medical and surgical supplies.—Aside from the cowpox vaccine and diphtheria antitoxin no medical or surgical supplies are available.

Use of hospital for sick from ships.—The senior health officer states that the hospital may be used to accommodate serious cases from ships at Progreso. Permission should first be obtained from the senior civil authority of Merida through the American consul at Progreso.

THE UPPER YANGTZE RIVER; SANITARY NOTES FROM U. S. S. "MONOCACY."

By W. B. Hetfield, Assistant Surgeon, United States Navy.

The cruising ground of the U. S. S. *Monocacy* is chiefly the upper portion of the Yangtze River in Western China. As the climatic sanitary features of the ports at which the ship is most frequently situated in this country are considerably different from those at which most of our ships stop, and as we, together with the U. S. S. *Palos*, are the pioneer American gunboats in this locality, a short survey of medical conditions seems appropriate in a report of this nature.

Topography.—The country is extremely mountainous, to such an extent, in fact, that the paths and even the city streets consist chiefly of rows of stairs. During the winter months the sun does not shine frequently for weeks and the air is damp and heavy; and while the thermometer rarely drops below 40 F., and is usually much higher, in the daytime one feels cold because of the intense moisture of the atmosphere. The average relative humidity about Chungking, the ship's base, where she most frequently lies, is 81.2°; it, however, goes as high as 93° very frequently. The prevailing wind is a northeast one. There is much rain and extremely dense fogs.

The hygienic features of the cities, particularly Chungking, are very bad. None of them have any sewage system, and human excreta is deposited in any and all places. The cities are infested with dogs; these animals are more frequently diseased than otherwise and live in the most intimate manner possible with the natives. Their chief function seems to be to devour all fecal matter not used for fertilizing purposes. As a consequence, conditions are ideal for the spread of animal parasites, and the extent to which the natives are infected is simply appalling. Ascariasis and ancylostomiasis are extremely common; teniasis is more rare. The dogs are likewise infected, many with *Dipylidium caninum*, which grows very large. Dysenteries, both amebic and bacillary, are very common and cause many deaths. The water supply is taken directly from the river and carried in buckets to the various consumers, as the natives use no prophylactic precautions beyond a simple filtration, and that infrequently; this water, contaminated as it is from the fields fertilized by human excreta, causes a great deal of typhoid, which is present at all seasons.

The excessively humid atmosphere, together with the lack of sunshine, causes a predisposition to tuberculosis; this predisposition, assisted by indiscriminate expectoration, renders the disease fearfully prevalent; although accurate statistics are unavailable, all the medical men who practice among the natives agree that a very large percentage of them are infected, and all types abound.

As to the population of Chungking, no statistics are available; it is estimated, however, as being anywhere from 300,000 to 500,000, crowded within the walls of the city. Prostitution is very prevalent, and the city is supposed to contain from 10,000 to 40,000 prostitutes. All venereal diseases, particularly syphilis, both in the acquired and congenital types, abound. The natives have acquired a high immunity to syphilis and seem to suffer very little from it, although the infection, when contracted by Europeans, is very severe. Tabes and general paresis are practically never seen. Ophthalmia neonatorum is a daily sight in the dispensaries and it is impossible to pass through the streets without noticing many staphylomata. Smallpox is extremely common, and it is a daily sight to see children and adults walking about the streets during the season with the rash out; it seems to be comparatively mild among the natives, since they never come to any of the foreign hospitals for treatment except in the rather unusual very severe cases, and these most always die, being almost moribund before applying for treatment. The great prevalence of lice and bedbugs in the houses, particularly those of the poorer classes, predisposes to the spread of such diseases as typhus and relapsing fevers, both of which are occasionally seen by medical

men. There are absolutely no quarantine rules or health regulations in force.

During the year 1915 the personnel of the *Monocacy* consisted on the average of 45 enlisted men and 3 officers. Generally speaking, the health individually has been excellent; one or two cases, however, have caused a comparatively high per cent of sick. We had one death. Percentage of sick, 1.5.

The fatal case was apparently one of typhus fever. There were no other infections. During the month of February we had an epidemic of a slight febrile malady which seems to be peculiar to this section of China; apparently it belongs to the dengue-like fevers, and would last from two to three days. A man infected would rise in the morning feeling well and would be about his work; suddenly he would be seized with a severe headache, pains in the back and joints, and fever, which would rise to 103 F. On the second day there would be little change, other than abatement of the fever by a degree or so; on the third day the patient would seem somewhat weak, but with no fever or pains. From then on his health would be excellent, and there were no recurrences. Beyond a slight lymphocytosis, the blood showed nothing. Practically everyone on the ship was attacked by this malady. After consulting with the local physicians it was found that practically all newcomers, sooner or later, were infected with the malady, and the clinical course of the disease was the same. As we had no vermin on the ship, and as it was likewise too early for biting flies and mosquitoes, it is difficult to understand just how the malady was transmitted. Fortunately, however, it was of little significance, many of the cases not going on the sick list at all.

We had one case of estivo-autumnal malaria develop and two tertian, all of which yielded promptly to quinin. No cases of dysentery developed during the year. Anopheline mosquitoes are infrequent. Of venereal diseases we had only nine admissions, six being syphilis, and the other three gonorrhea. The syphilitic cases almost invariably lacked a typical primary sore, the lesion presenting the characteristics of chancroid; diagnosis hence was not usually made until the appearance of secondaries. Protargol and calomel ointment were used for prophylactic measures just as soon as those admitting exposure returned from liberty. If it were possible to give every man a prophylactic packet to take with him, fully half of these cases would in all probability have been avoided, as they nearly all were the result of overnight liberty.

Everyone was vaccinated at least once, and many twice, during the year. There were 10 positive reactions. As the virus was fresh and of assured potency, the negatives were an assurance of immunity.

SOME ASPECTS OF MEDICAL INTEREST OF THE RECENT UPRISING IN CHINA.

By W. B. HETFIELD, Assistant Surgeon, United States Navy.

For about a month before Yuan-shi-kai declared China again to be a monarchy rumors of trouble began to circulate hereabout, and that conditions were very unsettled in the provinces bordering upon the upper reaches of the Yangtze—notably Szechuan and Yunnan—became very evident.

Then came the news that Yuan had declared the Republic a monarchy, with himself as Emperor. Yunnan Province then promptly declared herself independent, organized an army, and started an advance into Szechuan, where, at that time, there were only a few thousand Pekinese troops stationed.

Excitement became intense, particularly when the Yunnanese captured Suifu, a city of considerable size situated about 300 miles above Chungking, and started an advance upon Luchow, which is much nearer.

It looked as though there would certainly be fighting here, and a Red Cross society was promptly organized by the Chinese—the Chungking branch of their national organization. All the foreign medical men were invited to join and to act in an advising capacity. The board consisted of two missionary doctors, a German Army surgeon stationed here in connection with his country's consulate, and the medical officer of this ship.

We decided to take 60 men from the Chinese society and to train them to act as stretcher-bearers. They received as comprehensive a course in bandaging, application of splints, and other types of first-aid as time would permit, and became quite proficient. A suitable building was then selected as a distribution station. The wounded, having received first-aid at the firing line, were to be brought here, where their dressings would be adjusted and a more accurate diagnosis made, after which they were to be transferred to the foreign hospitals, to be cared for by the foreign surgeons in charge.

The foreign hospitals situated here are two missionary—Canadian and American Methodist, respectively—the German Hospital, and the French Catholique, the last named receiving medical supervision from the *Monocacy's* medical officer and a young foreign-trained Chinese resident surgeon.

At this time, the Government having commandeered all means of transportation, the northern troops began to pour into Chungking. Four divisions, each of 10,000 men, arrived in a remarkably short time considering the difficulties of travel at this season of the year when it is impossible for steamers to run the whole distance between Chungking and Ichang.

Chungking was made the base for all operations along the upper Yangtze. The Yunnan troops had meanwhile advanced upon Luchow and were within 100 miles of Chungking. Here they were met by the recently arrived Pekinese troops and a battle ensued, the Government troops being ultimately victorious.

Wounded now began to pour into Chungking, and very soon all the base hospitals located here and run by the Chinese Medical Corps were filled and the foreign hospitals called upon for assistance. The wounded were brought from the front in native junks, met on the landing by the Red Cross, and carried to the various hospitals. As it invariably took several days for the junks to arrive and frequently much longer, during which time the wounded received no attention whatsoever, and, as many of them were very seriously wounded, they usually arrived in very bad condition.

It was impossible to find out what facilities were available for the treatment of wounds at the front, but from the condition of the wounded when they arrived here I should judge that they had very few. Men would be brought in with fractures, practically all compound, without any splints, cases almost exsanguinated by preventable hemorrhage, some with gangrene starting, and, to a man, all infected, some horribly so.

Fighting was now taking place both above and below us, and so many wounded were arriving that the available medical men soon had all they could attend to. As fighting in the immediate vicinity of Chungking, however, now looked most improbable we decided to use the building, formerly selected to serve as a distributing station, as a hospital for the more slightly wounded in order to relieve the congestion in the hospitals and make room for the serious cases that were constantly arriving. The Chinese Red Cross would run this hospital, each foreign surgeon acting as a visiting physician, the period of duty being a week for each man in turn.

The following are the types of cases treated at the French Hospital by the medical officer, who was most ably assisted by A. H. Buzhardt, hospital apprentice, first class, and Madame Renée Guernier, wife of the commissioner of customs at this port and a member of the French Red Cross Society:

Wounds of the lower extremity.—1. Thigh: (*a*) Compound comminuted fractures of the femur.

These were all badly infected. In several cases the wounds were multiple, notably in one case in which the man had apparently been injured while in the line of fire of a machine gun.

Treatment: Free incision of wounds to allow proper drainage and the removal of pieces of bone, foreign bodies, etc. Casts, with a large opening for irrigation purposes, were applied when possible, the leg

being kept in proper position by metal bars fixed over the opening and incorporated in the cast. Where casts were impossible because of the multiplicity of wounds, Buck's extension, modified according to the needs of the case, was applied. Amputation above the knee for gangrene.

(*b*) Perforation through thigh with resulting arterial hemorrhage.

Treatment: Ligation of the femoral artery and vein, both of which had been severed by the bullet. Before these vessels could be reached at least a quart of blood clot had to be removed. The patient was almost exsanguinated. He reacted well, however, following an intravenous infusion of saline solution. Subsequent amputation had to be done, however, as gangrene started.

(*c*) Perforation through thigh without fracture, but with an intense infection and burrowing of pus in all directions.

Treatment: A good number of cases were of this type. They usually had high fever on admission. All the treatment they needed, however, was a number of free incisions, with the evacuation of large amounts of pus, which usually promptly brought the temperature to normal with a subsequent excellent result.

(*d*) Penetration of the knee joint with fracture of the patella and infection.

Treatment: Free incision.

2. Leg wounds: These were nearly all perforations with more or less intense infection and burrowing of pus, which cleaned up promptly with its evacuation by incision. One case was a fracture of the tibia just above the ankle joint by a bullet which had passed completely through the bone. This case was the only one of the fractures not infected, so that the ordinary treatment for such a condition sufficed.

3. Feet: Several of the feet wounds consisted of complete perforation by bullets, the wound of entrance being on the dorsal side. These cases were all badly infected and the small bones shattered. They yielded well, however, to free drainage with removal of osseous particles.

Abdominal wounds.—(*a*) Perforation of peritoneal cavity: Two cases of this type were admitted. In both the bullet had passed completely through the abdomen, emerging in one case through the left buttock, fracturing the left iliac crest en route, and in the other through the small of the back, just missing the spinal column. The first case had, on admission, symptoms of intestinal obstruction. Operation disclosed a condition of septic peritonitis with dense adhesions around the wound of entrance. The latter case had a large fecal fistula in the right iliac region. Both cases died a few days subsequent to admission.

(*b*) Penetration of the abdominal wall without perforation of peritoneal cavity. There were several such cases. In one a very large abscess had resulted. At least a quart of pus was evacuated at operation, subsequent to which his sweats and fever subsided and his improvement was rapid. The other cases needed nothing more than an occasional dressing.

Thorax.—The thoracic wounds were fairly common. Some had pulmonary perforation, the bullet passing completely through the lung, fracturing several ribs and causing a pyopneumothorax. Others had a lateral perforation of the pleural cavity, only without an empyema, and some were curious flesh wounds, the bullet glancing from a rib and passing out in the most unexpected positions. The first class of cases nearly always required a resection of one or more ribs in order to secure proper drainage.

Arm.—The majority of the arm wounds were compound-comminuted fractures caused by high-powered rifles, the bullet always passing completely through the arm. We treated fractures of the humerus, elbow joint, both bones in the forearm fractured, or only one. To a man they were badly infected and free drainage indicated. As soon as possible they were extended by weight, or flexed, according to indications, so that they could be dressed and irrigated without disturbing the bones in their set position. Many badly infected flesh wounds, the pus of which had burrowed in several directions, were treated in the ordinary manner.

Shoulder.—Some very interesting shoulder wounds were seen. In one case the ball entered the antero-lateral aspect of the deltoid muscle and, passing forward, was deflected by the first or second rib, which it fractured, and emerged from the postero-lateral portion of the deltoid without injuring in its passage through the axilla any of the large nerve trunks or vessels. A similar case in the German Hospital, however, severed the major part of the brachial plexus.

Neck.—There were several cases of neck wounds. In two the bullet had passed completely through the neck without injuring any vital structures. In a similar case in the German Hospital, however, the bullet passed through the spinal column, injuring the cord and smashing several vertebræ. This case died a few days after admission.

Head.—A number of interesting head cases were admitted. In one case the wound of entrance was in the ear, the bullet emerging from the mouth. Several had fractured mandibles. They were all infected and usually required the extraction of several teeth and the removal of particles of bone. We had no fractured-skull cases. Dr. Assmy, in the German Hospital, admitted two. In one the bullet had entered and emerged through the frontal bone, lacerating to a

considerable extent the frontal lobe of the brain. The other had a very extensive lateral fracture on the right side, with great damage to the brain and left-sided paralysis.

The wounds were all caused by either high-powered-rifle bullets or machine guns. No thrust or shrapnel wounds were seen. Many cases exhibited typically the explosive action of these bullets at certain ranges, when the jacket had been lost by contact with bone, or the course of the bullet deflected. In others the wounds of entrance and exit were of the same size.

The above types are typical of the wounded treated in all the foreign hospitals here, and afforded the attending surgeon a rather unusual and most profitable experience.

Medical diseases.—The natives apparently have a high immunity to the ordinary camp diseases, considering the great prevalence of typhoid and dysentery in this part of China, and their utter disregard of the rules of camp and march hygiene. We had, however, several cases of typhoid and one suspected case of typhus. All recovered. A few cases of tertian malaria were also treated.

Of the Chinese base hospitals located here, the one under the personal direction of Chief Surg. Col. Lieow is worthy of mention because of the excellent manner in which it was conducted. Everything was military—kept clean, and, as far as possible, considering the great difficulties and medical disadvantages of Chungking, up to date in all respects. The other hospitals, however, left much to be desired, and they seemed to consider the rules of hygiene and antisepsis of no importance whatsoever.

SANITARY NOTES FROM THE UNITED STATES NAVAL TRAINING STATION, SAN FRANCISCO, CAL.

By P. S. Rossiter, Surgeon, United States Navy.

After careful investigation of local conditions, the writer can not concur in the reiterated condemnation by many former medical officers of the climate of this locality, which condemnation appears in almost all annual sanitary reports except those of 1913 and 1914, but believes that the greater percentage of respiratory and contagious diseases occurring at this station, in comparison with other training stations, can be wholly attributed to a lack of the application of modern hygienic principles in the construction of dormitories, study rooms, and mess and drill halls; in other words, the relatively high sick rate is due *not to the climate*, but *to badly ventilated and insanitary* buildings.

In this connection, there should be noted that the Army posts in this immediate vicinity show a remarkably low percentage of sickness; one, Fort Scott, giving the lowest sick rate of any Army post.

The following is an interesting comparison among the personnel of the station itself:

During the closing months of 1915 there were stationed at the Panama-Pacific International Exposition from two to four companies of apprentice seamen from this station, replacing the Marine Detachment which embarked for Mexican waters.

The Panama-Pacific International Exposition was located only a few miles from this station, on the shore of San Francisco Bay, in a locality more exposed to winds and fog than is Yerba Buena Island. While on this duty the men lived in tents, tight and well floored; yet while the companies remaining at the station ran a gradually rising curve of sickness from respiratory and contagious diseases as the rainy weather caused their closer confinement to the buildings and produced 216 cases of influenza and 148 cases of mumps, the companies in camp at the exposition during this period were practically free from all diseases, yielded but 2 cases of influenza and 2 cases of mumps, and were singularly free from all colds and minor ailments, and when companies were changed the companies going into camp at once ceased to produce cases of respiratory diseases and those returned to the barracks began again to yield their regular quota.

This case is considered a parallel one with that of the Newport Training Station, which, during the period when apprentices at that station were housed in insanitary buildings, yielded a high percentage of sickness, being at the time generally attributed to climatic conditions, but since modern sanitary quarters have been erected that station has become relatively healthful, and the sick rate has markedly decreased.

While this may be cited as a similar case, it must also be said that while the number of cases of respiratory diseases has been high at the San Francisco Training Station these cases have been of a comparatively mild character, have resulted in very few respiratory diseases of a grave nature, and have given a very low mortality as compared with those of other training stations, which result can be only attributed to the milder and more equable climate of this locality.

Hospital Corps School.—The Hospital Corps School is steadily proving the soundness of this plan of instruction. By agreement between the medical officer of the station and the medical officer in command of the school, all pharmaceutical equipment and supplies of the station are turned over to the school, where all prescriptions are filled and all solutions, ointments, etc., used at the sick quarters and dispensary are prepared.

This seems an excellent plan, as it furnishes instruction in practical pharmacy to the student Hospital Corps and supplies the station

with a complete line of pharmaceutical preparations of excellent quality.

All laboratory equipment of the station has also been turned over to the Hospital Corps School, where an excellent laboratory is being equipped and where all chemical, bacteriological, and blood examinations for sick quarters and the station are made.

At a suitable stage in the course, students from the school have been detailed for instruction at sick quarters, where they receive practical instruction in bed making, temperature taking, toilet of the patient, administration of medicine, ward management, etc., and all surgical operations done at sick quarters are witnessed by a number of student hospital corpsmen, both actually in the operating room and from the floor above, where a glass dome in the operating room ceiling gives the effect of an excellent amphitheater.

INDEX TO UNITED STATES NAVAL MEDICAL BULLETIN, VOLUME X.

INDEX TO SUBJECTS.

(Articles not appearing in full in the BULLETIN are marked (ab).)

INDEX TO AUTHORS.

(Articles not appearing in full in the BULLETIN are marked (ab).)

O